CITY GOVERNMENT.

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ELECTROLYSIS AND ITS EFFECT ON WATER AND GAS PIPES, UNDERGROUND ELECTRIC CABLES, CONDUCTORS, ETC.*

BY CAPT. WILLIAM BROPHY, OF BOSTON.

Mr. President, and Members of the Association of Fire and Police Telegraph Superintendents and Municipal Electricians: The subject assigned to me by your president, electrolysis, is one that is of very great interest at the present time to every municipality in which exist public water works, gas lighting and electric street railway systems.

Perhaps it will not be amiss at this time to give a definition of the term electrolysis, which is chemical decomposition effected by means of the electric current.

When an electric current is sent through an electrolytic—i. e., a liquid which permits the current to pass only by means of the decomposition of the liquid—the decomposition that ensues is called electrolytic decomposition.

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The electrolytic is decomposed or broken up into atoms or groups of atoms or radicals, called ions.

The ions are of two distinct kinds, viz: the electro-positive ions, or cathons, and the electro-negative ions, or anions.

Since the anode of the source is connected with the electro-positive terminal, it is clear that the anions, or the electro-negative ions, must appear at the anode, and the cathons, or electro-positive ions, must appear at the cathode.

Hydrogen and the metals generally are cathons. Oxygen, chlorine, iodine, etc., are anions.

The vessel containing the electrolytic in which these decompositions take place is sometimes called an electrolytic cell.

An electrolytic cell is called a voltameter when it is arranged for measuring the current passing by means of the amount of decomposition it affects.

The principal effects of electrolysis are given in the following laws by Faraday:

First—The amount of chemical action in any given time is equal in all parts of the circuit.

Second—The number of ions liberated in a given time is proportional to the strength of the current passing. Twice as great a current will liberate twice as many ions. The current may be regarded as being carried through electrolyte by the ions; since an ion is capable of carrying a fixed charge only of + or — electricity, any increase in the current strength necessitated an increase in the number of ions.

Third—When the same current passes successively through several cells containing different electrolytes, the weight of the ions liberated at the different electrodes will be equal to the strength of the current multiplied by the electro-chemical equivalent of the ion.

The electro-chemical equivalent is a number representing the weight in grammes of an elementary substance liberated during electrolysis by the passage of one coulomb of electricity.

The electro-chemical equivalent is found by multiplying the electro-chemical equivalent of hydrogen by the chemical equivalent of the other element.

One coulomb (the quantity of electricity that flows in one second in the circuit whose resistance is one ohm, under the electromotive force of one volt) of electricity, expended electrolytically, will liberate .0,000,105 grammes of hydrogen. Therefore, a current of one ampere, or one coulomb, per second, will liberate .1,000,105 grammes of hydrogen per second. The number of .0,000,105 is the electro-chemical equivalent of hydrogen.

In the same manner the electro-chemical equivalents of the other elements are obtained by multiplying the electro-chemical equivalents of hydrogen by the chemical equivalent of the substance.

Thus, the chemical equivalent of iron is 28; therefore its electro-chemical equivalent is $28.0 \times .0,000,105 = .00,002,940$. By multiplying the strength of the current that passes by the electro-chemical equivalent of any substance we obtain the weight of that substance liberated by electrolysis.

Previous to the introduction of the electric street railways using the overhead trolley wire for one side of the circuit, and the track on which the cars run for the other, electrolysis was only thought of in connection with electro-plating processes; but since that time it has become a very serious matter for municipal authorities and others to deal with.

As most of you know, the first telephone circuits were "grounded," or, in other words, used an earth return, thus saving large sums in their construction, and reducing by one-half the number of overhead wires. In this way the telephone companies secured a valuable franchise without being obliged to ask the same from any municipal body or pay anything for it. This they enjoyed without interruption until the first electric street railroad was built, which threatened to destroy the efficiency of the telephone service.

While the electric railroads did not in the strict sense of the term use the earth as one side of their circuit, yet in practice it amounted to the same thing; for the uninsulated rails laid on the moist ground, were they continuous, would be "grounded" nearly their entire length; but they were not continuous, and little care was used in making the joints between the rails of equal conductivity with the rest of the track.

As a result of this form of construction, a large percentage of the current used in the propulsion of street cars escaped from the rails to the earth, where it found the best conducting mediums, such as water and gas pipes, over which it passed to the power generator from whence

*Paper read at Elmira Convention of Municipal Electricians.

it started originally. As one end or the other of nearly all telephone circuits were connected to these systems of pipes, these heavy currents soon found their way over them, making life a burden to the telephone officials, and inducing a vast amount of profanity on the part of the subscribers when they attempted to hold conversations with each other on business or other topics. The ears of the divinity that presided over the switchboard, known as the telephone girl, often tingled, and herself was often shocked by expressions more forcible than elegant coming from the lips of all classes, from the staid citizen to the callow youth, who, previous to the advent of this common disturber, embraced every opportunity to whisper soft nothings into the very same ears.

In order to save the communities from being totally damned (?) and at the same time prevent the destruction of their business, the telephone companies sought the aid of the courts to prevent the use by the railway companies of that which they had previously pre-exempted. They claimed that as "possession was nine points of the law," the tenth should come to their rescue and prevent this new-comer from trespassing on what they claimed as their own—viz: the entire earth—and there were persons in many places unkind enough to say "they already laid claim to nearly everything above it."

The courts, in nearly every case, decided against them, and as a result they had to release this ready and inexpensive conveyance for the transmission of electrical energy transformed into articulate speech, and add one hundred per cent. to their overhead construction by the use of what they had prescribed for the street railway companies, metallic circuits. This change overcame the electrical difficulties experienced in the telephone circuits and caused a better observance of the ten commandments, but it doubled the amount of overhead wire.

This increase was not looked upon with much favor by the fire departments, property-owners, or citizens at large. The streets were lined with poles and housetops with fixtures for the support of these additional wires, and in many cases they proved a successful barrier to the operation of the fire departments and have been a fruitful source of fire.

The very able and astute gentlemen who have so ably managed the affairs of the American Bell Telephone Company soon saw that this vast network of wires would in time become a serious menace to the public, owners of private property, and the powerful insurance interests; and in addition to the innumerable favors asked and received by the members of municipal governments, who are vested with authority to grant pole rights in the streets, they were met with the demands of property-owners for proper remuneration for the use of their property for the support of fixtures for wires.

The amount paid out by the telephone company and other owners of overhead wires for roof privileges each year was very large indeed. The manner of payment varied with the desire of the owner. Some required a cash payment; others were given free telephone service; others free lights; while in other cases the companies bound themselves to keep the roofs in repair so long as their fixtures remained thereon. To a company owning and operating thousands of wires this meant a very large outlay, and they began to look about for some means of relief. It was finally decided that placing the wires underground was the best, if not the only, remedy. The ends to be gained were as follows: A large saving in expense for roof rental; a very large reduction in the cost for maintenance; a more reliable service; freedom from interruption and destruction of lines by snow and sleet storm; and another most important point added to the foregoing reasons was one that is seldom mentioned by the telephone companies and others when seeking a franchise to build underground ducts, viz.: that the possession of an underground system effectually prevents a system of blackmail, known as fake competition, where the promoters, on the pretense of seeking to relieve the dear public from the excessive (?) charges of existing companies, seek a franchise for the sole purpose of selling it out to them at an exorbitant price, that often being their sole capital, together with a large amount of bluff and no end of unadulterated gall. It is to be regretted that promoters of this class are often aided and abetted by members of the municipal governments who possess a full knowledge of their true character, and knowing which pose as faithful public servants ever ready to promote the interests of their constituents, while privately sharing this species of the plunder, which eventually comes out of these same constituents' pockets.

Fair, honest and honorable competition is, as a rule, necessary, and should be encouraged, but it must be confessed that the possession of an underground system by a telephone company often proves an insurmountable barrier to a successful competition of this kind. Unquestionably the telephone management made a very shrewd move when they voluntarily decided to place their wires under ground, while others waited until they were forced to do so by the legislative enactments.

Having decided to adopt this system, the matter was turned over to the company's engineers to work out the details.

It had long been known through experience with aerial telephone cables that they should be highly insulated and of low static capacity. It was found that wires covered with cotton and treated with paraffine gave the best results; later a covering of dry paper gave still better results. The use of this kind of insulation rendered a covering for the cables that would be impervious to moisture, an absolute necessity for their successful operation, and lead was found to be best adapted for this purpose.

The work of building underground conduits was begun in the city of Boston by the New England Telephone & Telegraph Company on October 16, 1892, and has been continued up to the present time. The first ones consisted of 3-inch wrought iron pipe laid in cement; since then cement-lined wrought iron pipe and vitrified clay ducts have been largely used.

When the underground cables were first laid it was predicted and believed that they would need no attention for years, and that expenditures for maintenance would cease, "crosses," "breaks," "grounds," and the thousand and one other vexatious troubles, were ended; but in time these fond hopes were rudely dispelled; for, to the surprise of every one, the circuits contained in the underground cables began to fail, first one or two, and these were quickly followed by the entire sixty, or one hundred and twenty wires contained in the cables.

An examination of the cables revealed the fact that holes were found in the lead covering that permitted the moisture contained in the ducts to reach the insulation, and where corrosion occurred a black oxide of lead was found to have formed. Various causes were assigned for this peculiar action, but the true one was found by accident.

You all probably know that cables are drawn into the ducts in lengths of from 300 to 500 feet, and these lengths are spliced together in the manholes; the wires are first spliced and then a lead sleeve drawn over them and soldered to the lead covering by means of a plumber's joint. It was noticed by some of the workmen that when this lead sleeve was slipped over the splice and its ends came in contact with the lead covering of the cable, and when this contact was broken, sparks were emitted from these points. Measurements were made and large quantities of current were found flowing over the lead covering.

At that time the West End Street Railway Company was engaged in changing from animal to electrical propulsion, using the overhead single trolley system, and as little attention was paid to the conductivity of the rails and no attempt made at insulating them from the ground, large quantities of the current escaped thereto.

Measurements were made at different points between the street railway tracks and the underground cables, water and gas pipes and the ground, and current was found flowing from or to the track in all parts of the city. In the vicinity of the generating station it was found flowing from the rail, showing that the earth's potential was lower than the rail, while at all other points of the city the flow of current was found to be from ground to the rail, showing that the earth's potential was higher than that of the rail. It was also found that the corrosion of the lead covering of the cable occurred in that section where the earth's potential was highest.

This led to the supposition that the corrosion of the lead might be due to electrolysis, and to determine that point a simple experiment was tried, as follows: A sheet of metal was placed in the bottom of a barrel and covered with moist earth, and a short piece of lead-covered cable placed on the top of this earth; to the lead was connected the positive pole of a battery in which was developed a difference of potential of from 4 to 5 volts; to the metal plate was connected the negative side of the battery, the circuit being completed through the moist earth. A short piece of cable, which was not connected with the battery, was also placed on the earth in the barrel.

In a short time unmistakable evidence of corrosion of the lead began to appear on that piece of cable that was connected to the battery, and this continued until all doubts were dispelled, while the other piece of cable remained uninjured.

The corrosion of metals on the earth is due to the following conditions: A thin film of water surrounds these metals, and it is decomposed into oxygen or hydrogen by the electric current. Oxygen, when freely released, is always intensely active in combining with any metal present. The lead covering of the electric conductor within the ducts or buried in the earth is, as a rule, covered with a thin film of water, and it is not infrequently the case that the ducts and manholes are filled with water. In every case the lead takes the place of the positive and negative plates in the electro-plating bath. If the current of electricity, after traveling along the surface of the lead, leaves it to seek a point where the earth's potential is lower than that of the lead it decomposes the water, and the free nascent oxygen immediately enters into combination with the lead surface to produce lead oxide in the form of a paste, and iron oxide or rust in iron. The crust of oxide being permeable by water, a fresh surface of the metal is in contact and presented to the moisture; and the process is continued indefinitely until the lead covering is destroyed. The amount of metal thus decomposed depends on the amount of current flowing from the metal to the ground, while the potential may be as low as one-tenth of a volt. From a group of telephone cables running by the Albany Street power house of the West End Street Railway Company in Boston has been taken 500 amperes, which would decompose about 2.5 pounds of the metal in twenty-four hours. To lay pipes or electric light cables underground under these conditions and expect them to possess any lasting qualities would be the height of folly.

The cause being found, the next step was to find a remedy, and this the railroad company proposed to apply if it could be found.

The only remedy is the abandonment of the track as a portion of the circuit, but as that seemed impossible at that time, other measures were adopted.

First, the polarity of the railway circuit was reversed; the trolley being connected to the positive side of the generators instead of the rail, as formerly. This had the effect of reversing the potential of the earth, it being higher than the rails in the vicinity of the power house and lower in all other portions of the city; so that corrosion of the lead covering of cables and iron and lead pipes would occur only in the vicinity of the power-generating station.

The next step was to prevent this wholly or in part. That was accomplished by laying a 500,000 c. m. cable about 1,500 feet in length in one of the ducts of the telephone company, one end of this cable being connected to the negative side of the generators, while at each manhole the lead covering of the cables was connected to this return cable. In that way a path of lower resistance than that through the earth was provided for the current that leaves the rails and seeks to return by means of the cables, and thence through the earth to the negative side of the generators. The lead coverings of all underground cables are all tied together, so as to form a part of this derived circuit.

In addition to this, heavy return cables were run out over the railway system, which were connected at the station to the negative side of the generators, and were connected to the rails at short intervals throughout their entire length. These formed shunt or derived circuits of low resistance to the rails, thus reducing the amount of current they are obliged to carry.

Thus far this remedy has proved effective in retarding the corrosion of the lead covering of cables and water pipes, but I cannot speak so confidently of the condition of the gas pipes, as they are not continuous conductors of electricity, owing to the cement joints that are made in a portion of the joints of all lines of gas mains. If a current flow is established on these mains it will leave them at these cement joints and seek the earth, jumping over the joint and returning to the pipe again beyond it. Corrosion will surely take place at the points where the current seeks the earth again. This condition of affairs prevents the protection of lines of gas mains from the effects of electrolysis in the manner herein described as applied to water pipes and underground electric cables, because the gas mains are not continuous electrical conductors.

Other plans besides the one here described have been proposed, but they all have the same end in view—namely: to maintain the potential of the rails above that of the earth, and where that was impossible to provide an easy passage for the current from the pipe over some conductor other than the earth. The most promising of these plans is to raise or lower the potential of water pipes, etc., at the necessary points by means of small generators propelled by electric motors, these generators to be placed in circuit between the rails and water pipes, cables, etc.

Electrolysis is sure to take place under favorable conditions, such as rails of insufficient carrying capacity, and where they are not properly bonded.

Where the metal substances are surrounded by moist earth and the potential of the current flowing over them exceeds that of the earth, electrolytic action is sure to take place.

Most of the street railway companies owning and operating systems in large cities are fully alive to the necessity of reducing the evil effects of electrical leakage from their tracks; first, because it involves a large loss of electrical energy; and next, because, in time, it may result in serious complications due to the loss of property, and possibly life, by reason of the failure of water pipes, the leakage from gas mains, and other causes. It can now be said the street railway construction in most large cities has been greatly improved in this respect since the first road was equipped with electricity, but there are some, and, I fear, a good many, notable exceptions. Where fuel is cheap or where an abundant water power can be utilized the chief incentive to husband the energy produced, by keeping it on the circuit instead of permitting it to wander away to other and more inviting paths where its presence is not desired or needed, is lacking.

In some sections of the country I have seen electric railway construction that would lead me to suppose that coal was cheaper by far than rail bonds, and that the

rights of others, and the safety of the community were of too little importance to be thought of.

Can the corrosion due to electrolysis be entirely stopped so long as the tracks of the street railways are used as electrical conductors for the propulsion of street cars? My answer is that, while the evil can be greatly reduced, it cannot be entirely prevented while the present overhead system is in use. When it is possible to lay the bare iron wire of a fire or police telegraph circuit on the ground and have no escape of current therefrom, and expect efficient service from the system, then we may expect corrosion due to electrolysis to entirely disappear. Is there any of you here who would construct a system in this manner? Surely not. Neither would you erect poles for one-half the circuit and for economy's sake lay the other on the ground, and expect satisfactory results.

Time and the inventive genius of our country will find a substitute for the overhead trolley less expensive and equally as efficient as the open slot conduit with underground conductors and a metallic circuit, now so successfully operated in the cities of New York, Washington and some European cities; until that time comes we must insist on the best forms of construction, such as ample carrying capacity of rails and bonds, reinforced by return feeders, and constant inspection of the same.

CONSTRUCTION AND CARE OF SCHOOL BUILDINGS.

The report of the Indiana State Board of Health for the quarter ending June 30, 1898, contains the following valuable recommendations in regard to the construction and care of school buildings:

1. Site.—The site of the building should be at least as high as the surrounding ground and well underdrained. Sufficient space should be allowed to secure reasonably large playgrounds, and an abundance of light, air, sunshine and freedom from noise from neighboring buildings. This space should not be less than 40 feet on each side. Buildings not meeting these requirements should be officially condemned in writing by the health officer to his board.

2. Closets.—The closets should be separate, should be clean, in good repair, have good walks leading to them and have a high, tight fence dividing them. If within the building, they should be perfectly ventilated and perfectly cared for. Boxed plumbing should not be permitted.

3. Drinking Water.—The drinking water should be pure, and in no instance should buckets and tin cups be used. If there is a well, it should be driven, never dug, for dug wells always receive surface drainage; and it should have a good, easy working pump, supplied with a sink and drain to carry away the waste. The drinking cups may be heavy stoneware, small, heavy glass tumblers, or of porcelain-covered metal. A water tank having a spring faucet should be supplied, if water must be carried any distance.

4. Heating.—Heating by ordinary stoves is objectionable. One-room school houses should be warmed by ventilating heaters, which take their air from outside the building, warm and evenly distribute it through the room. School rooms should never be heated by direct steam or hot-water radiators. Hot-air furnaces should take their air from outside the house and introduce it into the room above the breathing line—that is, six to seven feet above the floor. If heated by steam or hot water, the coils should be without the rooms, and the air passed over them should be taken from the outside. Heating by warm-air furnaces is indirect under all circumstances. It may be divided into three classes: First, heating by furnace without ventilation, and this the State board condemns; second, furnace heating ventilation by the gravity system, which is allowable, but not the best; and, third, furnace heating and ventilation by mechanical system and fans to control the circulation of air. The third class is by far the best method.

5. Ventilation.—It is absolutely impossible, as proved by exhaustive experiment, to properly ventilate school rooms by windows and doors, without draughts. We greatly fear draughts, but bad air is much more to be feared. Every school room should have ventilating flues. In large school houses it would be best to have mechanical ventilation—that is, remove the bad air by fans, and, as stated under "Heating," introduce warm air by fans above the breathing line. In the case of one-room school houses already built and warmed by ordinary stoves, these stoves should be condemned and ventilating heaters recommended. When this reform cannot be accomplished, the health officer could recommend that a solid board, six inches wide, as long as the window sash is wide, be placed beneath each window sash. This will raise the lower sash six inches and stop the opening; then the space where the lower and upper sash join would permit the entrance of fresh air without causing a draught. This is only a makeshift. Another and far better method of ventilating one-room school houses is to provide in the centre of the room a galvanized iron pipe, fifteen inches in diameter, reaching from six inches above the floor through the roof into the outer air, and having a hood on the top. Into this, about seven feet from the floor, conduct the stove pipe, running the same from the point of entrance through the centre of the large pipe to its very top. The ventilating process is simple. The hot stove pipe warms the air surrounding it within the large pipe, causing it to rise and thus creating a current upwards. As the large pipe is supported above the floor six inches the bad air of the room is drawn out.

6. Lighting.—It would be wicked for the school authorities to injure the eyes of a single student by casting sand into them. It is equally as wicked for these same authorities to injure eyes by improperly lighting school rooms. Light should always be admitted from over the left shoulder and from behind. When windows are opposite each other, cross-lights result and are liable to cause eye strain. As all our one-room school houses have opposite windows, we must know that many eyes have been injured, but much of the ill-effect may be prevented by supplying each window with two curtains, one to roll upward and the other downward. This would make it possible to properly temper the light. The walls of a school room should be painted. The color may be a faint green, blue or gray. The good effect upon the eyes of painted walls is not slight. Blackboards should be a dull black. Glossy blackboards are an abomination.

7. Cleanliness.—It would seem unnecessary to even speak of cleanliness in the school room, but alas! there are school rooms in this State which are very dirty. What a farce it is to try to impart knowledge to young minds in dirty, dilapidated school houses! When the teacher reads "cleanliness is next to godliness, and godliness leads all," the pupil in the dirty room will not be impressed.

8. Economy.—It is unquestionably wicked extravagance to build, or to allow to exist for a single moment, such a thing as an unsanitary school house. Better a hundred times have no school than to hold it in a school room that is improperly ventilated, improperly heated, improperly lighted and improperly kept. If a trustee says he cannot afford to make needed sanitary improvements, tell him emphatically it is exactly the other way—the people cannot afford not to surround their children with the best sanitary conditions.

MUNICIPAL ELECTRIC LIGHTING.

Address by Prof. E. W. Bemis, Before the Detroit Convention of the League of American Municipalities.

Mr. President and Gentlemen:—Although informed a week ago that a short address would be desired of me, I did not know until the last speaker began that anything was desired before to-morrow night, so I have no notes at the moment, but will give you offhand a few points that I had expected to touch upon relative to the recent progress of municipal electric lighting.

In the last few months I have been in correspondence with as many of the public electric light plants of this country as possible, and about seventy of these plants have given me full returns regarding their expenses, the date of beginning business, etc.

I have now a record of the location of 353 electric light plants, and there are some others that will, I expect, bring the number up to about 400. In 1892 there were only about 200, and the first example of public ownership began about 1884, in the small place of Fairfield, Ia., so you can see great progress is being made.

Every one of the seventy plants making full returns was taken, no matter whether its results were good or poor, and an effort was made to compare them with privately owned plants which were similarly situated. It is difficult to find plants that are thus similarly situated, because of the different prices paid for coal, the hours burned, the candle power of the lights and whether or not commercial lighting is done.

In order to make this comparison I was able to use a bulletin of about 500 privately owned plants in this country—the bulletin issued by the General Electric Company, of Schenectady, N. Y. It was made out in the fall of last year, giving the prices charged for street arc lights, the number of hours the lights burned, the price paid for coal, the number of lights, etc. Then I divided public plants into about ten classes; in the first place, those burning 1,200 candle power per arc were separated from those burning 2,000; then I divided them according to the number of hours per year, those burning 1,800 hours or less, those burning 1,800 up to 3,000 hours, and those over 3,000 hours; then divided them as to what they were paying for coal, putting by themselves those that used water power. Then I took every private plant without exception that could be classed in the same category with the public plants, and placed them together, so that I had on the one side the prices charged the city for their arc lights by the private companies. On the other hand were placed the operating expenses of the public plants; both those that had commercial lighting and those that did not. But, of course, that was not sufficient for comparison; it was necessary to compare the charges to private consumers on the part of the public and private plants. Data were not fully at hand for some of the private plants, but it was possible to secure the reports in Massachusetts and Michigan. It was found that on the average the charge to private consumers in the same class of plants was much lower where the plants were owned by the cities than where privately owned.

Then the allowance to be made by the public plants, for interest, taxes, depreciation, etc., had to be considered. In the first place, interest varies from four to five per cent., sometimes a little less than four and sometimes five. Then as to depreciation. The plant in Detroit was built, as many of you know, by one of the most capable electricians in this country, Mr. Dow—he gave me estimates—and I had similar ones from Topeka, Kan.; Aurora, Ill., and many others. They say you should allow from seven to ten per cent. for depreciation. Let us see what the private companies allow themselves. For the last six years they have been making returns to the Massachusetts Gas and Electric Light Commission, and in these returns you find the average depreciation in Massachusetts is under three per cent. That is not final, but it cuts off the private companies from claiming the public plants do not allow enough. The general opinion from many of the States I have studied is that five per cent. was a liberal allowance to make for depreciation. In fact, the largest depreciation that Mr. Foster claims should be taken—and he is a fair opponent of city ownership—is seven and one-half per cent. So I gave two columns, one where five per cent. and the other where seven per cent. was allowed for depreciation.

Now, what capital account should be taken? It will not do to take the cost of construction and extension, because if a plant cost $100,000 and charge itself five per cent. depreciation, then there will be but $95,000 on which to charge interest and depreciation the following year. In every group of from three to ten plants, arranged according to the price of coal, character of light, etc., the average cost to the public for light was found to be less under public ownership, even when allowance was made of seven and one-half per cent. for depreciation and taxes and five per cent. for interest, than it was in the similar group of private plants, to say nothing about the fact that almost every one of the private plants sold light to private consumers, while about half the public plants could not get permission to do this from their legislatures, and it further appears that, as I have indicated, where public plants did sell to private consumers, they did so at a lower price.

The municipal plant that has been the worst managed, according to the belief of electricians, namely, that of the city of Chicago, is now, and has been for about a year, vastly improved. The operating expense there until 1897 was $117 per arc light per year. They expect to lower it this year to about $70 for each arc light, and that in a city where they have to be to an unusual expense for their conduits and wiring. The city of Chicago, when it undertook city ownership, was paying $175 a year for its lights from a private plant. The city of Detroit has one of the most finely equipped plants in the country; the operating expenses the past year show a reduction of from $64 to about $50 per light. They burn their lights all night and every night—lights of 2,000 candle power.

DISCUSSION.

The President:—There are parties who have stated that the report of results from Detroit is not a true statement; have you investigated that?

Prof. Bemis:—It does not include depreciation, or allowance of taxes. I said operating expenses, and only referred to the plant for operating expenses. Speaking of Detroit, you might like to consider the question of fixed charges. The cost of the plant, according to the report, which I was glancing over this morning, is about $350 for each arc light. According to Mr. Dow, who is not now connected with the plant, it could have been constructed for about $30 per arc light less, but not because it was dishonestly constructed, but simply because they desired an extensive system of burying the wires, and because they located their power plant at a place suited for other purposes. Take $300 approximately per arc as the present value after over two years of depreciation, and allow ten per cent. on that for interest, depreciation and fixed charges. All the old company was paying for taxes was less than $3 per arc, and the interest charged in Detroit was about four per cent. on the bonds. Ten per cent. on $300 would make $30 fixed charges, which, added to the $50 for operating, would be about $80 for each arc light. Some further information might be given, but does anyone wish to ask further?

Alderman Wesley Sears, Jackson, Mich:—I desire to ask Mr. Bemis a question or two. I have been very much interested in the question of public lighting. I live in the little town of Jackson, this State, and there has been very much agitation there in regard to the question of municipal ownership of a public lighting plant. Much talk has been indulged in, and I took it upon myself to hunt out different figures, and correspond with about fifty cities, and some time I want to sit down quietly with the professor and compare notes. Now, we have a city of 30,000, a private corporation doing all the public lighting and private lighting, and all of the electric power business of the city, the lights running for the year at least 3,800 hours. Now, I don't know, Mr. President, if this is enough data to work from, but I can furnish other data. We have 2,000 candle power lights. I want to know what would be considered a fair price for the city to pay for 238 arc lights, all night and every night service. There is no fault found, so far as I know, with the number of hours they run. We light practically before it is

dark and they run until daylight in the morning. Now, what ought we to pay per year? And I want to ask another question—whether with these conditions it will pay Jackson to organize and build a municipal plant? I will state to you the price we pay when I know about what we ought to pay.

Prof. Bemis:—I consider it would not be proper for me to give an answer in that form. If I had the tables I could give you an average of cities similarly located. I do not care to commit myself offhand to a fixed and definite statement. You have to take into account the commercial lighting feature. If the public plant could have commercial lighting it would have some help, of course. A private plant that does both, ought to be willing to do street lighting as cheap as a public lighting commission. Take Detroit here, paying $50 a year for burning about the same number of hours, and about $30 to add for fixed charges; in the city you speak of the fixed charges probably would not be over $20. On the other hand, the cost of operation would be somewhat more. The city of Detroit has no private or commercial lighting. If your city was not thinking of doing commercial lighting it is quite likely it would be satisfied with $75 or $90, but I do not think it is quite scientific to make statements without some comparison, but I would like to have you give your experience.

Mr. Sears:—I am very much obliged for the kindly reply. I appreciate the difficulty in some measure under which the professor must labor. Let me say in addition to what I have already said on the question that I began to search in this matter because there had been repeated statements made that arc lights should be produced by municipalities for anywhere from $40 to $60, but that I believed to be under certain conditions. There is a whole lot of difference between burning 1,500 hours and 3,800 hours, and I criticise the bulletin that was put out by the Municipal League, because it did not get down to a definite basis—you simply stated "moonlight" schedule or "all night" schedule. "Schedules," so far as having any definite meaning, are worthless for purposes of making comparisons. You want to know what we are paying. A few years since we were paying in Jackson about $90; subsequent to that a price was made, bringing it down to $82; something more than a year since we took the matter up with our lighting company and got them to concede to us a price of $70 a year. This spring we agitated the question again, and the council took the matter up again, and we now have the 238 lights for $16,100 per year, an average of $67.65, "outages" to be deducted from these figures, and it is 2,000 candle power light. Now, do you think it would be a pretty good thing for Jackson to build its own plant?—it does not seem to me to be a question of whether we should have municipal lighting or not, but whether we are getting our light for a reasonable price—which at present averages only 1 $^{78}/_{100}$ cents per lamp hour—I want to know if that is cheap enough?

Prof. Bemis:—If the city that you speak of was not proposing to do commercial lighting those figures would be low. There are a good many cities that are doing private lighting and charging for it ordinary commercial rates and a little less, and are making from that enough to cover all the operating expenses of the street lights, leaving for street lighting nothing but fixed charges, and in some cases covering that, too, but that is where they have an extensive amount of commercial lighting.

Mr. Sears:—I want to say the city of Jackson has never seriously contemplated the putting in of any light plant for commercial purposes. I want to ask one more question. My figures show this: that the average cost of municipal lighting in Massachusetts, where reports are official, is far more than we find the average cost of lights as reported by municipal lighting plants throughout the country. Will you please explain how that happens?

Prof. Bemis:—In the first place, the plants in Massachusetts are small. There is no plant that had been running over a year in a city of over nine thousand population when the Massachusetts Gas and Electric Light Commission made its last report. Most of the cities are very small, and they have to pay a large price for coal, coal being from three to four dollars per ton. The average difference per year per arc burning every night and all night is six dollars—for every dollar difference in the price of coal—and coal is from three to four dollars a ton in Massachusetts, while it is one dollar and a half here. The Massachusetts law says that whenever a town wants to have a municipal plant it must buy out a private plant if there is one. When most of the plants were built or bought they had to pay a good deal for those private plants; but the law is so changed that they are not obliged to take account of that so much now, but the public companies think they paid more than they ought to because of the state law, and the inauguration of a good many public plants is checked because the law is indefinite as to how much the public should pay for the existing private plants.

Mayor S. M. Jones, Toledo, Ohio:—They pay men for labor in Massachusetts. Somehow they think it is necessary for a man to have enough to live on. The city of Boston pays two dollars to its street laborers for a nine-hour day's work, and that would make quite a difference, too.

PUBLIC LIGHTING.

—The Fort Wayne, Ind., council has adopted a long set of resolutions providing for the establishment of an electric lighting plant on the Springfield, Ill., plan in case the company at present lighting the city refuses to accept the terms dictated by the council. The argument of the resolutions is based on the presumption that arc lights, burning on the all-night schedule, can be furnished under the Springfield plan at from $45 to $50 per year each —a presumption that is far from reasonable.

—The private electric company now lighting the streets of Grand Rapids, Mich., has offered to sell its plant to the city on any of eight different propositions. The eighth proposition says: "If none of the foregoing propositions are satisfactory we will sell the entire plant at an appraisal made by disinterested parties to be chosen as follows: Your honorable body to decide on one, we to choose the second, and the two thus selected to choose the third, and their finding to be final."

—Riverside, Cal., with a municipal plant, provides arc lights on the all-night service at a cost of $62.76 per lamp per year. The report of Manager Brown, of the city lighting system, for the year ending June 30, 1898, has just been issued. It shows that the total expenses for the year, including interest amounting to $1,900 and the redemption of $1,000 of bonds, were $18,850.08, while the total receipts for light, power and wiring were $12,861.18. The difference between the expenses and the receipts, $5,988.90, represents the cost to the city for the lights used on streets and in public buildings. The report shows that incandescent lights cost the city 40 cents per month each, and arcs $5.23 per month each.

—The Globe Lighting and Heating Company, of Chicago, has been given a two-year contract to furnish 400 16-candle-power street gasoline lights for the city of Duluth, Minn.

—Mayor Frank E. Davis, of Gloucester, Mass., writes that his city is about to put in a complete police signal system.

—Kansas City, Mo., pays $4,600 rent yearly to a private company for police telegraph service. It is one of the few large cities without police signal systems of their own.

—The council has elected D. W. Heaton chief of police of Parkersburg, W. Va., to succeed J. H. Anderson, resigned. Up to the time of his advancement Mr. Heaton was city detective, which office has been abolished.

STREET PAVING.

Address by Hon. R. J. Saltsman, Mayor of Erie, Pa., Before the Convention of the League of American Municipalities.

Mr. President and Gentlemen of the League of American Municipalities:—Our secretary, Mr. B. F. Gilkison, informed me in July that he had taken the liberty of placing my name on the list of speakers, and the subject assigned to me was "Street Paving;" also that the executive committee had limited these addresses to ten minutes. Now, ten minutes seems a very short time to give this great subject, and there are so many different kinds of pavements and the results obtained in different cities are so varied that it compels me to confine my few remarks largely to the city of Erie. I hope that I may advance some ideas and cause some open discussion to take place. We have in the city of Erie medina stone, cobble stone, sheet asphalt, block asphalt, and various kinds and qualities of brick, such as shale, fire clay, glazed and unglazed.

Before we attempt to pave a street the declaration is made from one to two years before the pavement is laid; the object of this notice, which is given to all parties, is that all connections shall be made with sewer and all other underground work and completed a sufficient length of time, so in case the dirt is not properly tamped, the earth in the street will assume its natural condition, so the pavement will not settle irregularly

It was the custom with the city government to appoint as inspector on our street pavements and other public improvements some one who lived on the street, a man oftentimes not familiar with the work in construction. About two years ago an ordinance was passed creating an office of ward inspector of sewers, pavements, etc. The inspector, appointed for one year, is supposed to be a man of good judgment and reasonable education, and if he does not understand the work, we teach him, and in a short time we have a man thoroughly competent for the position as inspector on pavements or any other contract work the city may have on hand. We find since the adoption of this system we rarely have any complaints from property holders who are to pay for the improvements, and the contractors' work is more satisfactory.

Our pavements formerly were laid under a five-year guarantee, but in late years our pavements are laid under a ten-year guarantee.

The first pavement laid in Erie was in 1860, and was cobble stone. The last laid of medina stone was in 1890, all laid on gravel foundation; this pavement is durable, but entirely too rough for the improved ideas of the present day. About four years ago the city, as an experiment, made a contract to asphalt one square or block, about four hundred lineal feet, on cobble stone pavement, and it has proved a success, and there is no question in our minds that an old stone pavement is as good a foundation for a coat of asphalt as concrete, and would materially reduce the cost and give the street a first class pavement. We have 36,415 lineal feet of streets paved with this cobble stone, and it will not be long before all our cobble stone pavements will either be replaced by improved kinds of pavement or coated with asphalt or some other composition. The first sheet asphalt pavement laid in our city was a sample strip of about 165 feet in length, laid by A. L. Barber & Co., in 1880 or 1881, on West Sixth street. This sample is good to-day, after being laid eighteen years, very little if any repairs having been necessary. In 1883 the asphalt pavement was continued west on said street five blocks, or about 3,300 lineal feet, by contract on a five-year guarantee, and the city has paid hundreds of dollars for repairs on this extension. The pavement lasted very well during the length of the guarantee, but we have been compelled to have it repaired yearly since the expiration of said guarantee. Up to the year 1892 all our sheet asphalt pavements were laid on a concrete foundation of six inches in thickness, and the asphalt was laid in two coats, called the cushion coat and the topping or wearing surface; the cushion coat after compression to be one half inch in thickness and the topping or wearing surface two inches.

In 1892 there was inaugurated into the construction of sheet asphalt pavements a binder consisting of a fine bituminous concrete and asphaltic cement. This binder, after being compressed to one and one-half inch in thickness, is covered with asphaltum compressed to one and one-half inch in thickness. All sheet asphalt laid since (1892) has been laid with a binder and compressed. The object of making this change from two layers of asphalt to what is termed a binder, was to hold the asphalt in place; without the binder the asphalt was liable, with heavy teaming, to ridge and then shortly break through, and the street would have to be resurfaced, largely, incurring a large expense to the city after the contract time had expired. Therefore, our experience and my observation in differnt cities is that sheet asphalt with a proper mixture and correctly heated at the works, not scorched or burned, can be laid successfully in any climate and is a durable pavement.

Shortly after my induction into office I discovered that our specifications for this pavement called for Bermuda or Trinidad Lake asphalt, and these asphalts were controlled by the Barber Asphalt Company. The result was that Erie, like many other cities, and probably some to-day, was paying virtually two prices for asphalt pavements. The price paid in our city up to 1896 was about $3 per square yard. We had our specifications changed by adding "any other asphalt of equal quality." When the next asphalt pavement was laid we had competition, and the price fell to $1.85 per square yard; the next pavement to $1.83 per square yard. In laying this kind of pavement it is customary to appoint inspectors to see that it is laid on the street according to specifications or contract, which is all right as far as that part goes, but it is much more important for the interests of the city to have a competent and reliable man stationed at the asphalt works to oversee that the proper proportions of asphaltum, sand, etc., are closely adhered to, according to the specifications. It seems to us from our observation that this pavement under a five-year guarantee lasts nicely for five years, and under a ten-year guarantee, laid apparently in the same way, lasts nicely for ten years, and laid as sample, as stated above, in our city, is now in good condition after eighteen years of service. So by this you may see the importance of having the proper consistency in the mixture; also the necessity of having a substantial foundation.

We have only part of two streets paved with block asphalt. The first block asphalt has been laid about four years and is in good condition; the second one was laid last year and from present appearances is the finest pavement in the city of Erie. These asphalt blocks are laid on a two-inch cushion of lake sand, under which is a six-inch concrete base.

We commenced to lay brick pavements in 1893. Some of our streets, when in our judgment the foundation or subsoil was sand or gravel, we simply excavated the required depth and refilled with gravel, then thoroughly rolled with an eight-ton roller, and then coated with a two-inch layer of lake sand, also rolled, and then brick laid on edge; then fine lake sand sprinkled on top of the brick pavement and allowed to remain until all the interstices are filled with sand. These pavements are in very good condition and look as though they would last indefinitely. Our city, however, has come to the conclusion that a concrete base with a two-inch cushion of fine lake sand is the proper and best foundation for brick or asphaltum block.

The brick that our city are using and seem to give the best results are an unglazed square edged brick. The glazed and beveled cornered brick are not satisfactory to us, as they are too smooth for the traveling of animals, and also too noisy. Before the brick are laid the concrete should lay at least two or three weeks before the cushion of sand is covered and brick laid, in order to have the cement properly hardened. All pavements are laid with a crown, and if the bricks are laid before the cement is perfectly set the concrete will settle away from the brick, causing a hollow space which will act as a sounding

board, and complaints will arise from the peculiar noise as horse and carriage pass over same.

For heavy traffic streets, or business streets, my impression is that, taking the cost and durability into consideration, the brick pavement is the best, and for residence streets the sheet or block asphalt is most desirable. There are no kind of pavements laid but there are some objectionable features. As we are now laying our pavements, and which seems to be the best way, is as follows: Sheet asphalt, six-inch concrete, one-and-one-half-inch binder, one-and-one-half-inch topping, equal to a nine-inch excavation; block asphalt, six-inch concrete, two-inch sand, four-inch block, equal to twelve inches of excavation; brick, six-inch concrete, two-inch sand, four-inch brick, equal to a twelve-inch excavation.

I might add that up to 1897 our sheet asphalt streets were laid with Trinidad Lake asphalt; last year we had 720 lineal feet paved with California asphalt, and the street now presents a fine appearance.

Hose street sprinkling on asphalt pavements is very injurious and should be prohibited; the water rots the pavements. Our pavements, when necessary, are sprinkled by wagon, and followed shortly after with street sweepers. That cleans the streets at night by forcing the debris into the gutters, and the next morning men and teams gather up the material and cart it away. Our cobble and medina pavements are largely cleaned by ward men and hobos. Being situated on the lake, we are troubled with an element of humanity known as tramps, and about two years ago we inaugurated a system of putting them at work street cleaning, and have done good service in two ways for our community—by utilizing them when caught and convicted, and also by reducing to a large extent the numbers that formerly infested our vicinity.

MUNICIPAL OWNERSHIP.

Address by Hon. J. A. Johnson, Mayor of Fargo, N. D., before the Convention of the League of American Municipalities.

Mr. President and Gentlemen of the League of American Municipalities:—It is with a great deal of pleasure that I again meet with you and can congratulate you all on the success that has followed our meeting of 1897 at Columbus. This and future meetings of the League of American Municipalities will be of far greater benefit to the American public than any one could have foreseen when the first step looking toward the formation of the League was taken.

Of the many subjects to be discussed by eminent gentlemen at this convention, to my mind there are none of more importance than that of "Municipal Ownership of Public Service Industries." The matter of municipal ownership of water works, gas and electric plants, as well as street railways, is of comparatively recent origin. Our predecessors, of a generation ago, were not bothered with the question of municipal ownership, as we understand it; they had easy sailing, as compared with their successors of to-day. Then it was expected that private corporations would furnish water and light at such prices as they saw fit; and if their patrons did not like either the price or the service the only consolation they received was "Well, what are you going to do about it?" while to-day statistics are gathered from every corner of America and sent to the municipal officers who thus get the benefit of the experience of brother officers all over the country, enabling each to better guard the interests which are intrusted to his care. Of the municipal ownership of the various public services, the one which has been tried the longest is water, and that it has met with satisfaction not only to the municipalities who have adopted it, but to the patrons of the same, goes without saying. Where a few years ago the question had hardly been thought of, to-day there are hundreds of cities who own and operate their own water works; and in every case you could not get them to go back to the private corporation system. The little city I have the honor of representing had a contract with a private corporation, but after a long struggle succeeded in forcing a sale of it to the city, and the rates were reduced 60 per cent. The cost of fire protection is less than the rental of hydrants from the private company, and yet our water works takes care of itself. We are now putting in a new 3,000,000 gallon pump; the one now in use being inadequate to furnish water for all purposes. Perhaps the most striking result of municipal ownership of water works is at Cleveland, O. In 1897, after deducting extensions and operating expenses, including interest on its bonds, it showed a net profit of $365,052.92, and yet water was furnished at a price no private corporation would have furnished it for.

In public lighting we find the prices paid by the various municipalities under contract, under similar conditions, are so unequal as to be, indeed, startling. With your permission I will give you a few comparisons in both municipal and contract lighting.

Ashland, Pa., pays $115 per year per lamp, while Erie, Pa., pays but $61.86; Providence, R. I., pays $127.75, while Woonsocket, R. I., pays $146; Alton, Ill., pays $90, while East St. Louis, but twenty miles distance, pays $110. Spokane, Wash., had a contract for $96 per lamp per year, up to September 1, 1897, and when the city threatened to put in its own light the Edison Electric Co. cut the price in two and made a contract for $48. Above are for all-night lights of 2,000 candle power. The difference in moon-light schedule is equally great, being at Huntington, Pa., $54.15 per year; $120 at Fort Wayne, Ind., and $123 at Sacramento, Cal.

When we look at the municipal lighting plants we find that considering conditions, such as fuel, labor, etc., the prices are comparatively uniform. I will mention the cost of a few both all-night and moon-light schedule. Of the all-night plants the one which is operated at the least cost is Bangor, Me., costing but $35, including interest and depreciation, while the one costing the most is in this beautiful city of Detroit, where it costs with a liberal allowance for interest, depreciation, loss of taxes, etc., the sum of $89.42.

Of the municipal run on the moon-light schedule we find the cost, including interest and depreciation, is from $52.82 at Muncie, Ind., to $65.78 at Frederick, Md., and as low as $29.10 at Danville, Va., not including interest or depreciation. The municipal plant which can, perhaps, be taken as a pattern is at Wheeling, W. Va. The city of Wheeling owns both its gas and electric plants, and in 1897 it expended in improvements, extensions, etc., for both plants, the sum of $6,153.02, donated to hospitals and other charitable institutions, which, if owned by a private corporation, would have to have been paid for, gas to the amount of $6,243; after paying all operating expenses covered into the city treasury the sum of $2,649; showing actual profits derived out of its commercial lighting the sum of $15,045.16. The lighting not only of streets and public places, but commercial lighting as well, where it has been changed from contract to municipal ownership; under no circumstances would they change back to the contract system.

Like comparisons could be produced indefinitely, but time will not permit me doing so. The question of the municipal ownership of street car service has as yet been tried but little in the United States. In Europe, where it has been in operation long enough to give it a fair test, it has proven very remunerative to the cities which have tried it. Glasgow, Scotland, is a notable example; from the revenue derived from its municipal ownership of public service all the running expenses of the municipal corporation are paid, thus obviating the necessity of having any local taxes for municipal purposes. There is no reason why the same results could not be obtained in the United States, if properly handled, and we will not admit that we cannot do as well as they can in Scotland or elsewhere. What we do know as the result of the granting of franchises to private corporations for gas, electric lights and street railways is that the grantees soon become so powerful that they absolutely control all the functions of the municipal governments and dictate such terms as they see fit, and woe to the man who tries to stand by the people, if by so doing he opposes their interests and incurs the

hostility of these corporations that have received their franchises as a gift from the public. Some of us have felt the power of these corporations who have gotten wealthy on municipal franchises. There are men who held responsible positions in this body who have incurred the enmity of private corporations, and who, when it came to re-election, corporate money was spent as freely as water to defeat them, having tried to control them, and, failing to do so, they were marked for slaughter. But the people, whom we all serve, are awakening to the necessity of standing by the men who will not bend the knee to corporations, and each year it will be harder for any one to be elected to a municipal position who is not known to be in favor of municipal ownership of public service.

In my opinion this League, representing as it does the leading and most progressive cities of both the United States and the Dominion of Canada, should place itself squarely on record as favoring the municipal ownership of at least water works, gas and electric lighting, as well as street car service.

BOARDS, SINGLE-HEADED COMMISSIONS OR COUNCIL COMMITTEES.

Address by Mayor W. E. Young, of Akron, Ohio, before the Convention of the League of American Municipalities.

Mr. President and Delegates to the Convention:—I am really placed in a somewhat embarrassing position, owing to the fact that I just arrived in the city, and did not know that I was to be the first speaker. I also came in too late to share in the very complimentary notice in the morning press. Of course, when they said this convention was composed of a fine lot of men they hadn't seen the Akron delegation. (Laughter.) When I first started out in the practice of law, in the city where I hung out my shingle, there were many other young men in the same line, and among us we organized a sort of debating club and held meetings once a week to talk over our cases that had been brought to us by our numerous and respectable clientage. At one of these meetings we noticed that one of our members had had very little to say, and one of the boys asked him what the matter was—we always called him "Judge." "I believe he has not had a single client, and he hasn't anything to talk about," said one of us. "Don't you think it," said he, "I have had the best one I ever had during my whole practice," and they asked him why he hadn't told them about the knotty problems that had been propounded to him, to which he replied: "If you fellows will explain to me something I can't explain myself, I will explain it to you." I have often thought that many of our speakers and writers have attempted to speak and write on some things and some topics they don't understand, and that is pre-eminently true of writers and speakers on municipal affairs. But there is perhaps an answer for that: they are either theorists or men who have had no practical work in those affairs, and that is just what your speaker is now.

When I was first invited to take part in this discussion I thought with my experience in municipal affairs that it would be almost impossible for me to say anything of benefit to my hearers, but I remember an instructor that I had in my early youth who always said, "You only learn things by doing." Another reason that the men who are taking active part in the solving of these very important municipal problems are unable sometimes to work out well defined principles of action is that a majority have been called to office even before they were known to be candidates. The result is that many of our active workers along these lines do not have sufficient time to fit themselves for their duties in order to do good work. When a man in a large manufacturing establishment is about to select some one for a certain place, he selects one who is by experience in that work capable of doing what he requires, but that is not generally true in municipal affairs; the majority of the men at the helm are men who have had no experience in these lines, and they have to spend the greater part of their terms in learning how to do instead of doing.

Now, about the subject I am to speak of. I believe the subject bears on single-headed commissions or council committees, or, in other words, how shall the business of a city be conducted? It seems to me the answers to these questions would almost be as varied as the conditions in the city you are about to govern. First, you would have to consider the size of the city, the character of its population, its industries, etc. It is evidently true that the mayor of a city of 50,000 inhabitants migh have a different answer to give to this problem than the one who had but 5,000 to govern, and the one at the head of a city of 500,000 might not agree with either.

You take a city of five, ten or fifteen thousand inhabitants, and the expenses that must be met by any particular form of government are an important factor in the principles to be followed. Departments mean an expensive form of government, but it does seem to me, leaving this question of expense out of the calculation, there can be but one answer to this question. Take our government by boards: now if these boards, consisting of three or four men, are salaried officials, this means quite an expense; if they are not salaried, they devote so much time as they can spare from their business, and the result is that whatever work they do must be done without giving it due consideration. Many of these men who are working on these boards where no salary is received are doing good work, and I would be the last one to censure them, for they are like every other man—they must look to their own interests. A man who is worth anything as a member of a board must be a good business man, and the result is that in many of our cities we could not have a government consisting of boards; we could not have a department of public works, another department to take care of buildings and another for streets, if we were compelled to pay salaries. Another objection is this: the action of these boards is seldom carried on the same as that carried on under the control of a single individual. It frequently happens that there is one master mind that controls the board; he is the "real thing;" the others follow in line, and he is very likely brought into contempt because he is called the "Boss," while the other fellows are mere puppets; but, again, if you find several masters on the boards, the result is that a much needed improvement is not carried on because they cannot agree, and we have these frequent deadlocks, where they are equally divided. Nearly all the objections I have made to these boards would belong with equal force to affairs controlled by councilmanic committees. It seldom, if ever, happens that a member of a council is selected to that position because he is fitted for the work he has to do. It is seldom, if ever, that I have known of instances where men were chosen in their respective wards because they seemed to have an aptitude for it; but when a man runs for the council neither he nor his friends know what he has to do there. However, a government by single-headed commissions, which you will conclude I favor, means a government by departments, of a man placed at the head of each department, and he to be held responsible for the business of his department. That is an expensive form, but seldom, if ever, does it cost as much as governing by boards, and then you have some one upon whom you can place the responsibility, and some one to call to account for neglected duty.

Now I said in starting out, you would first have to take into consideration the kind of city you want to govern; also that you would have to consider the size of the city and the character of the citizens, and also its industries, and the kind of government that is in vogue there at present. These are the things we come in contact with every day, and any one can speak more intelligently of these things if he has had experience in them than he can on theory, and I thought it might be well for each speaker to let the delegates know the form that is in vogue in his city.

Up to 1893 we had no administrative branch in our city. Up to that time it was by councilmanic committees; they decided what improvements should be made, and this work was then carried out under the direction of the city engineer, solicitor and city clerk. These three officers were about the whole push;

whatever they said went; but in 1893 the legislature passed a special act giving to our city and Youngstown a board known as the board of city commissioners, consisting of four members, two of whom were to be democrats and two republicans. The members were to be appointed by the probate judge of the county and the mayor acting jointly; one who didn't owe his position to the people of the city, a man who had been appointed by the county, and the other a man who did owe his position to the city. The first year they selected four members, two of them for two years and two for four years, and after that two members were to be elected every two years, and each to receive a salary of $1,800. Now, we have had that form of government for five years, and I do not want to be understood as saying it is not an improvement over the old form. I think it is a vast improvement, but the citizens of Akron think there could still be more improvement. We thought it could be removed from politics. What was the result? Every time an appointment was to be made, these commissioners, mark you, didn't ask themselves the question, "Now, the first thing is, is this man fitted for the position he seeks?" but they asked themselves this, "What is his politics?" and "What were the politics of the fellow appointed the last time?" Then, if they have solved the question—and there is a kind of understanding among the board that they are to have turn about at it—it will go by politics. It seldom, if ever, happens that a member of that board secures his first choice, and the result is our appointees are the result of a compromise, but after we get them in there we have to become responsible, even though we have no voice in saying who they should be. The mayor has been robbed of nearly all his administrative power, though he still holds the police court; and yet they want to hold him responsible for everything that is done.

What we should have is a federal form of government, the mayor should be the chief executive officer, and he should hold the heads of the several departments responsible for the work done in those departments, and I want to say to you that we are going to have it.

After our last convention, we of Ohio got together and organized an association of our own. We organized the Ohio League of Municipalities, and we went down before the legislature, and while a great many people thought we did not accomplish anything, still we secured through our influence and the help of our friends a bill providing for a recommendation commission. Why, in the state of Ohio we have hardly two cities having the same form of government.

Now, gentlemen of the convention, I have said a great deal more than I was intending to say, but from the way I feel I want to say that Akron is heart and soul in this work. We sent fifteen fellows up here, and we expect to send delegations as long as this organization is in existence. I want to close by complimenting that young man who, they have said, organized this convention for his own benefit. I met him this morning and I said, "I always like to see a man who knows his business," and that is what I think of the gentleman who instituted this movement; he knows his business, and we have gotten tenfold out of it.

COST OF DETROIT'S LIGHTING.

The following statement bearing upon the cost of operating the municipal lighting plant at Detroit, Mich., is taken from the report of the public lighting commission for the year ending June 30, 1898:

The fiscal year just closed is the first in which a municipal lighting plant of any size has had as near a thorough test as possible, and the results are awaited by those interested for and against an institution of its kind. The physical results—that is, the conversion of fuel and water into electric current—for the year will bear comparison with the results of any plant, commercial or otherwise, generating electricity. The results from labor will not compare as favorably for the reason that slightly higher wages are paid and much shorter hours of work obligatory.

The commission considered that the plant, operated under its enforced conditions, should produce an arc light of 2,000 candle power for the year at about $50, and the heads of departments were instructed accordingly. The first step was the reorganization of the force of employes. The heads of departments and clerks were put on the salary list, and made subject to call for work at any time, day or night, without extra compensation for work in excess of eight hours per day. The operating crews were assigned work in three divisions of the day; i. e., from 8 A. M. to 4 P. M., from 4 P. M. to 12 M., and from 12 M. to 8 A. M. The repair crews and clerks were assigned to duty from 8 A. M. to 5 P. M., with a noon hour for dinner. Employes in the operating crews having similar duties were allowed to exchange shifts between themselves. The arbitrary shifting of crews was abolished, and the former relief crews done away with. This resulted in a marked saving of labor and in station maintenance supplies. The item of trimming was a very heavy one, and the routes for trimmers were rearranged, increasing the work from an average of 59 lamps to 74 lamps and 7⅜ miles average length of routes. The work of each trimmer, however, was calculated to be done in about seven hours, the trimmer walking his circuit, and no work to be required of the trimmer after completing his circuit.

By these economies the commission was able to reduce the cash outlay per lamp from $64.19 per annum for a monthly average of 1,564 lamps for the preceding year, to $51.85 per annum for a monthly average of 1,744 lamps. The reduction was largely in the item of labor, being reduced from $43.57 per lamp to $33.27 per lamp, while the reduction in the cost of supplies was from $20.62 to $18.58 per lamp.

To arrive at the cost of an arc lamp to the city of Detroit per annum there should be added to the above cash cost of $51.85 a certain amount for interest on the investment, for loss of taxes through the plant not being owned by private parties and for depreciation. The first two items are easily computed, for the average investment for the year was, in round numbers, $750,000, with interest at 4 per cent., and the assessed value of the same was placed by the city assessors at $400,000, with the rate of taxation at $17.68 for the city and at $3.24 for the State and county, a total tax of $20.92 per $1,000; but with the latter—that is, the figuring of the depreciation—there is a wide difference of opinions. As per the statistics published by the London "Electrician" it is customary for the municipal lighting plants of that country to set aside annually about 3 per cent. of the entire investment as part of the expenses for a sinking fund. The writers on the subject in scientific journals in the United States have ranged from 3 per cent. to 7½ per cent. as the amount to be charged off for depreciation or for a sinking fund. This commission held in its preceding report that a plant established and maintained similar to the Detroit city plant should not be subjected to a heavy expense item for depreciation or a sinking fund. The commission held that only a "wear" depreciation should be charged, and then only on such parts (as boilers) which, after a period of time, would have to be changed as an entirety. As a compromise, however, the commission takes the rate of 3 per cent. to set aside with the cost of a lamp per year for a sinking fund or depreciation, and the reader may change that rate as per his pleasure. Computing these fixed charges, we have:

Interest at 4 per cent. on $750,000 average investment	$30,000 00
Depreciation at 3 per cent. on $750,000 average investment	22,500 00
Taxes at $20.92 on $400,000 assessed valuation	8,368 00
A total of	$60,868 00

Proportioning this on the basis of the electrical output, we have $55,207.27 chargeable to arc lighting, or $31.65 per annum per arc lamp. The total cost of an arc lamp to the city of De-

troit per annum on these figures may, therefore, be placed at $83.50.

In February, 1893, the Detroit Electric Light & Power Company offered to light the city of Detroit for a period of ten years at the rate of $102.20 per arc lamp per year. While there are no recent bids available from which the exact cost to the city of an arc lamp by commercial companies may be obtained, it is entirely reasonable to presume that in common with all other industries the cost per lamp has been reduced at least 10 per cent. during the interval of five years which has elapsed. The cost, therefore, at present may be assumed to be not greater than $90 per arc lamp per year. For a number of reasons it is believed that the rate of $90 per year is a conservative figure, which may be justified.

Taking that assumption as correct, it will be seen that the amount per arc lamp which the city has saved during the past year, after allowing the 3 per cent. for depreciation, as compared with the cost of the same lamp by a commercial company, was something less than $7. This narrow margin, the commission believes, fully justifies its course in reducing the expenses during the past year to the lowest minimum possible consistent with the best service and the limiting conditions under which a municipal plant must always be operated.

While it is possible that improvements in some machinery may be made soon, which would cause a partial loss to the city of the value of part of its investment in machinery, on the other hand it is only fair to state that there is an equal probability of compensating improvements in other devices and which will enable the city to further reduce the cost per lamp per year. Reductions in cost, due to such improvements, of course would not accrue to the city if it already had a lighting contract extending over a period of years.

The ultimate success of the plan of municipal ownership of a public lighting plant, viewed from the standpoint of economy to the taxpayer, cannot as yet be claimed to be assured in the city of Detroit. Time is an essential element of consideration in arriving at a judgment at all valuable upon this question. The plant, the business of which we have the honor to administer, has been in existence since April, 1895, but it is only since November 1, 1897, that the construction feature of our business was completed and the plant placed upon a purely operating basis. This period is entirely too short to justify absolute conclusions as to the ultimate success of the municipal venture from an economical view.

The margin of profit per lamp at the present time, while it is not large, nevertheless is a showing to the advantage of the city, which it is to be hoped will be maintained or increased in the future. It is but just to observe in this connection that the quality of light furnished has been uniformly of the full standard of 2,000 candle power, which is better than was found practicable to obtain of contractors; and also that collateral advantages not easily reducible to terms of pecuniary value have accrued to the city by reason of its operation of its own lighting plant. The results, such as they are, have been secured by the commission only by the practice of the strictest economy and the rigid exclusion of all of those elements so apt to intrude into the administration of public municipal affairs, and which operate only to confound business principles and political expediency in perplexing entanglement. It has not been at all times easy to persuade some that these two policies occasionally clash irreconcilably, and, in the determination of the one or the other to be followed, it was the duty of the commission to be guided solely by the interest of the taxpayer.

SPOKANE'S FINANCIAL CONDITION.

According to the annual report of George Liebes, city comptroller, the city of Spokane, Wash., is in better financial condition than ever before. The business of the city is now transacted on a cash basis, and by refunding the outstanding warrants an annual saving of $14,500 in interest has been made. The bonded debt of Spokane amounts to $1,320,000, and the floating debt to $687,284.

A CHEAP ROAD PAVEMENT.

A member of the board of public works of Des Moines, Ia., suggests a cheap way for improving roads and light traffic streets. The plan is this: After the road has been graded so that it will drain properly, about two inches of gravel is placed upon the surface. A ten-ton roller is then run over the gravel, packing it down so hard that ordinary traffic does not cut it up or push it off into the ditches on either side, as is the general result when it is placed on in the ordinary manner, seven or eight inches deep and not rolled. Generally, where the road is not sufficiently sloping to afford good drainage, a tile drain is placed beneath the gravel to carry off the water and keep the ground as dry and firm as possible.

Of course the road is not permanent with the one dressing. The second year another inch of gravel is added, and the road is again rolled. Sometimes the same thing is repeated the third year, when the road is generally in condition to last for fifteen or twenty years with ordinary care and attention.

The beauty of the system is its cheapness. The work is comparatively inexpensive. Roads can be improved that way and assessed to the abutting property owners, where if ordinary paving was done the property would be confiscated by the expense. The expense of the improvements mentioned would not be at all oppressive if collected in the way paving assessments are.

IMPORTANT MUNICIPAL CONVENTION.

One of the most important municipal conventions of the year will be that of the American Society of Municipal Improvements, to be held at Washington, D. C., October 26 to 27. This society, which was organized in 1894, is composed principally of civil engineers connected with city governments, and has also in its membership a number of other city officials, but all men of experience in the line of municipal improvements. The programme for the Washington convention is not ready for publication, but will include a number of very valuable papers on subjects of the utmost importance to city officials and all others interested in the progress of municipal work. Some of the very best work accomplished by the organization is done through its various standing committees, the members of which devote considerable of their time during the entire year to gathering information relative to the subjects assigned to them. The reports of these committees, presented at the annual conventions, are always replete with authentic and valuable information. Some of the important standing committees, the reports of which will be submitted at the Washington convention, are made up as follows:

Committee on Street Paving—N. P. Lewis, engineer of street construction and maintenance, Borough of Brooklyn, New York City; E. B. Guthrie, chief engineer of grade crossing commission, Buffalo, N. Y.; George N. Ames, city engineer, Grand Rapids, Mich.

Committee on Electric Street Lighting—F. W. Cappelen, city engineer, Minneapolis, Minn.; D. Hunter, Jr., city electrician, Allegheny, Pa.; Robert Ballard, Syracuse, N. Y.

Committee on Sewerage and Sanitation—Capt. L. H. Beach, engineer commissioner, Washington, D. C.; Dr. J. M. Withrow, Cincinnati, Ohio; J. H. Pearson, city engineer, Louisville, Ky.

Committee on Municipal Franchises—Andrew Rosewater, city engineer, Omaha, Neb.; B. Saunders, board of public works, Toronto, Canada; P. C. Justus, board of public works, St. Paul, Minn.

Committee on Water Works and Supplies—M. L. Holman, water commissioner, St. Louis, Mo.; M. R. Sher-

rerd, engineer water department, Newark, N. J.; Willis P. Tharp, engineer water works, Cincinnati, Ohio.

Committee on Disposal of Garbage and Street Cleaning— Dr. J. L. Hess, health officer, Cleveland, Ohio; Dr. A. R. Reynolds, Chicago, Ill.; O. E. Davidson, board of city affairs, Dayton, Ohio.

Committee on Electrolysis—Carrol P. Brown, electrical engineer, New York City; J. A. Cabot, city electrician, Cincinnati, Ohio; E. W. Boynton, commissioner of public works, Davenport, Iowa.

The present officers of the American Society of Municipal Improvements are: President, Harrison Van Duyne, board of street and water commissioners, Newark, N. J.; vice-presidents, L. W. Rundlett, city engineer, St. Paul, Minn., E. H. Keating, city engineer, Toronto, Canada, A. E. Thompson, city engineer, Peoria, Ill.; secretary, D. L. Fulton, superintendent of highways, Allegheny, Pa.; treasurer, John L. Kennedy, board of public works, Nashville, Tenn.

WHY COMPARISONS ARE ODIOUS.

C. M. Carpenter, secretary of the Ayers Asphalt Paving Company, during the course of an interview in New Orleans recently, was asked why pavements in that city cost so much more, apparently, than in Northern cities.

"In reply to that question," said Mr. Carpenter, "I can only say that comparisons are odious unless you have the full data at hand, in order that you may know the exact conditions surrounding each contract. I know of no two cities, to start with, where the specifications are identical. The requirements differ in every city in the Union. Some cities, for instance, require Portland cement in the concrete, while others require domestic cement. Some admit the use of well-screened gravel, while others demand the use of crushed rock or broken stone. In some cities crushed rock can be obtained as low as 75 cents per cubic yard, where the quarries are conveniently located, while in New Orleans shells are used in place of broken stone, and they cost over twice as much. In a large number of cities conveniently located to the many different cement mills domestic cement is furnished as low as 50 and 60 cents per barrel on the street, while in New Orleans domestic cement is worth nearly twice this amount, and Portland cement, which is a necessity in a great deal of concrete here, costs in the neighborhood of $2.75 per barrel. This simply illustrates one of the legitimate reasons for the higher cost of the pavement here than in a great many cities in the North. The cost of excavating here or grading is fully twice as much as in many other cities, on account of the character of your soil. Then, too, the cost of excavating is included in the price of your pavement, whereas, in the North, as a rule, it is one of the extras, and when the average taxpayer is seeking information regarding the cost of work for comparisons he fails to make the proper inquiry regarding this point, as well as many others, and he takes it for granted that the bids are made upon the same basis. Perhaps one legitimate cause for the increased cost in New Orleans for pavement over the average Northern price is the fact that your payments due the contractor are not made promptly upon the completion of his work in cash. You may say, too, with a great deal of reason, that certificates from the city bearing 6 per cent. interest for the city's proportion of the work, and certificates bearing 6 per cent. interest and becoming first liens against the property for the property owners' portion of the work, make the contractor absolutely secure, but in accepting this kind of paper as payment for his work, he must use his credit to carry on the work, and he must also use to a certain extent his credit to realize upon these certificates. In doing this the contractor assumes a certain risk and an expense for the collection of these certificates which he cannot avoid, and must provide for in his bid. The consequence is that the taxpayer really foots the bill, and his pavement costs him in excess more than it costs the contractor to assume these risks and the expense of collection. This seems a great pity when the city of New Orleans could, by the use of its own credit, pay the contractor in cash and save to the taxpayer all this additional cost, besides giving him more time in which to meet his payments at a much lower rate of interest."

BRICK PAVING FOR SMALL CITIES.

It is very satisfactory to our clay-workers and many others to see what rapid strides brick is making as a paving material for small cities, and many streets in larger ones. In saying small cities, I do not mean those of two or three thousand, but those of from ten to thirty thousand as well; and we all know that some of our large cities are using brick with good success.

Why are brick so much used? Simply on account of their merit. True, they are not always satisfactory. Where poor brick are used, bad foundation, or lack of knowledge in construction exists, we would not expect the outcome to be satisfactory; but when material is first class, foundation solid concrete and the construction is under a competent engineer, I think we will find brick an ideal paving material.

In considering the desirability of a paving material, one of the most important items is the cost—not the first cost alone, but the cost of maintenance as well. A small city has not the wealth to afford granite, neither has it the traffic to require it. Asphalt makes a beautiful street, but does it wear like a good brick? Besides costing more to put down, the cost of repair far exceeds that of brick.

When I speak of a good brick pavement I do not have in mind one made of second-class brick, laid on sand or crushed stone, but a good brick. In constructing your street, look well after the drainage. This is as important as the sub-grade. You cannot make a smooth, uniform pavement without a good sub-grade, and this you cannot have unless all soft places, new drains, gas and water mains are looked after in time, and the sub-grade above them made solid by proper rolling. I think concrete is the only foundation to use in any locality. On made grade you will find concrete more satisfactory than any other foundation. The grading is done when the ground is practically dry, and you cannot detect all soft or unsound places. If gravel is used for the foundation, moisture, through capillary attraction, will cause it to go down, leaving a depression in the pavement. When broken stone is used, the sand cushion will in time work down and also leave a depression; but with a good concrete foundation we can have a smooth pavement.

The filler for brick pavement is a matter of importance. Our first paving was filled with sand, but I found that with sand as a filler the brick chipped at the edges badly. Then we used cement and find that we have a noisy pavement, although the brick stand much better, partly because the brick are better and partly because the edges are better protected. I am honestly of the opinion that a good asphalt filler, such as is manufactured by the Assyrian Asphalt Company, will serve the purpose better than either sand or cement, because it will protect the edges, and, I think, overcome the rumbling noise as well. I admitted their asphalt filler in my last specifications, and look for good results.

Not many small cities can afford the more expensive materials, and why should they, when so good a material can be had as our hard vitrified brick? Prof. J. B. John-

son, of Washington University, St. Louis, Mo., says he finds brick to be stronger than granite. He has tested brick as high as 30,000 pounds pressure to the square inch, the strength of granite being 12,000 to 18,000 pounds. In addition to this the fact that a brick pavement is one of the cheapest as well as one of the easiest repaired, is clean and gives good foothold for horses, taken all round it is a desirable material. I see that among the business men of Chicago there is much favorable comment on the brick pavement on La Salle street. It is standing a very severe test.

Just how long it will take to educate the people up to the fact that streets must be maintained, I do not know. Some seem to have the golden streets of the "New Jerusalem" in mind, and are disappointed when "they find not their like on earth, perfect, and with no need of repair."

Another thing that detracts from the appearance of our brick streets (our own, in a measure, included) is the fact that they are not kept clean. We are too short-sighted not to see that clean streets are as necessary as well made ones. We are delighted to have beautifully paved streets, but it is quite another thing to have them beautifully clean.

One of the best reasons for having good paved streets is that they may be kept clean. There is no estimating how much disease is prevented by having well-paved streets that can be and are kept clean. Who ever heard of sweeping the filth that accumulates on macadam or other rough streets? That would be impossible, so it is left—horse manure, banana peelings, expectorations of humans afflicted with consumption and all kinds of diseases, with other innumerable and unmentionable filth. All this is left for us to inhale in the dust that is blown about and which might be largely prevented if streets were properly paved and kept clean. So, from a sanitary reason, if no other, we should have well-paved streets. There is nothing that adds so much to the appearance of a place as fine paved streets.

Show me a city where the council or board of public works are indifferent as to what kind of an improvement they have, or are too penurious and short-sighted to put in good, permanent improvements, who are always suggesting that a little patching here or there will do, or, if they finally consent to building a new street, make it a cheap improvement that will soon call for the eternal patching—show me such a place, and I will show you a place that cannot hold its own progressive, public-spirited business men. They are sure to go to a more wide-awake town, and, surely, desirable business men who are seeking a location will not select a place that is 'way behind the times.

One of the surest indications of a city's up-to-dateness is good streets, and I am confident that, all things considered, brick is to-day the best paving material for small cities, and, I am inclined to think, for large cities as well, but am unable to speak from personal experience in regard to the latter. Our experience here in Kokomo is very favorable to brick. We put down our first brick pavement in 1895, and it is in first-class condition to-day. It has needed no repairing whatever, and does not seem likely to for a long time to come.—A. W. Smith, City Engineer of Kokomo, Ind., in the "Clay Worker."

—Chief of Police Janssen, of Milwaukee, wants twenty-five additional patrolmen appointed. The police force of Milwaukee has not been increased since 1894, although it is claimed that the population has increased by not less than 40,000. The present force consists of the chief, four lieutenants, three sergeants, eight roundsmen and 275 patrolmen. The question of granting Chief Janssen's request for more men is now being considered by the council police committee.

THE BIG FIREMEN'S CONVENTION.

Preparations are well in hand for the annual convention of the International Association of Fire Engineers, to be held at St. Louis, Mo., October 18 to 21. The programme for the sessions of the convention has been arranged with a view to bringing out a most comprehensive discussion of the many important questions involved in the work of protecting life and property from the ravishes of the fire fiend. The topics to be discussed and the leading speakers are as follows:

ANDREW J. KENNEDY, PRESIDENT.

Topic No. 1—Practical benefits of gymnasium to fire departments. Charles Roberts, chief fire department, Denver, Col.

Topic No. 2—At what temperature will water, when applied in given quantities, be transformed into gas or steam, and thus aid combustion; and what conditions should govern the size and pressure of streams used by firemen in fighting fires. George C. Hale, chief fire department, Kansas City, Mo.

Topic No. 3—What are the benefits and advantages of automatic sprinklers. Charles E. Swingley, chief fire department, St. Louis, Mo.

Topic No. 4—What style of horse is best suited to the fire service; is breeding essential. James Devine, chief fire department, Salt Lake City, Utah.

Topic No. 5—Auxiliary pipe lines for fire protection, operated by fire boats. J. W. Dickinson, chief fire department, Cleveland, Ohio.

Aside from the discussions noted above there will be several special papers read. Capt. William Brophy, city electrician, of Boston, is preparing a paper explaining the danger of showing pictures by the vitascope and similar machines. William McDevitt, inspector of the insurance patrol of Philadelphia, will present a paper treating the inflammable and explosive properties of smoke when confined in a burning building. E. S. Loring, a consulting architect, of Syracuse, N. Y., will explain how to avoid faulty construction of buildings.

To promote discussion of subjects pertaining to prevention and extinguishment of fires, the board of directors have decided to have a question box at the meeting, into which all members can place questions that they desire brought before the convention for discussion. The box will be opened and questions read on the afternoon of the third day.

Manufacturers of fire department apparatus and supplies from all parts of the country will be present to exhibit their goods, and this feature of the convention will doubtless prove of much interest. It is understood that the second day of the convention is to be devoted exclusively to the exhibition.

Local committees at St. Louis are now at work preparing to give the delegates an enjoyable as well as an instructive time, and the entertainment features of the programme will be numerous. Several hundred delegates will go from the East.

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SPECIAL NOTICE.

City officials and friends of City Government visiting New York are cordially invited to make the office of City Government their headquarters during their stay in the city. Desks, stenographers and stationery are placed at their disposal, and their mail may be addressed in our care.

NOTE AND COMMENT.

Chief McAfee, of the Baltimore fire department, is a young man of more than ordinary intelligence and ability, and his official record is a particularly bright one. However, the chief must understand, sooner or later, that the intent of the law that requires advertising for bids on public contracts is to secure for the public the benefits of fair and open competition and to prevent officials from making public contracts on a private basis. For some time the city of Baltimore has been buying fire hose on the recommendation of Chief McAfee, and this otherwise astute young chief has made the mistake of permitting no competition, pleading that only one concern in the United States makes hose good enough to be used in the Baltimore department. Being a man of superior intelligence, the chief must know that there are at least a half-dozen brands of fire hose every bit as good as, if not better than, the standard he has set up in Baltimore. He must know, also, that these other brands, having been used for years in many of the best conducted fire departments in this country, have stood all necessary tests. His statement that there is but one sort of hose fit for use in Baltimore and that the use of any other brand would be tentative, is the rankest kind of twaddle. We would like to ask Chief McAfee why he does not recommend that the contracting board receive bids on all the brands of hose known to be of the first class. We do not want him to reply that there is only one first-class brand—because there are several hundred old and experienced fire chiefs ready to laugh at such a statement. The contracts for fire hose at Baltimore, we believe, are let by the board of awards, and we would suggest to the members of the board the wisdom of making a little investigation of the subject before accepting the solitary standard set up by their fire chief. In this matter we do not doubt the honesty of Chief McAfee. He is evidently allowing a personal prejudice to run away with him. Some day the people of Baltimore will become interested in this case of nullifying the law that is intended to secure for them the benefits of fair and open competition for public contracts. In a large city there are always many people ready and eager to criticise public officials too severely. Chief McAfee, who is doubtless as honest as he is efficient in his official position, should not leave himself open to any such criticism.

James Devine, chief engineer of the fire department of Salt Lake City, and one of the most efficient firemen in this country, in his annual report to the board of fire and police commissioners, says:

> The fire department of this city occupies the anomalous position of having its appropriation and number of men reduced, while the city has been growing in population and structural greatness. * * * * Much has been said and written of late recommending that taxation must be reduced, and in order to accomplish this that the expenses of the fire department must not be increased nor its service extended. I would suggest to the advocates of this policy that the tax-payer is not the beneficiary of this ostensible reduction in his taxes. Insurance rates are measured (or are presumed to be measured) by the fire protection furnished by the municipality, and on this hypothesis, which is the basis of all insurance rates, the tax-payer would be the beneficiary by increasing the appropriation for fire protection; he could put $2 rebate on insurance in one pocket while he paid fifty cents fire tax out of the other pocket.

Mr. Devine uses very plain language to present a very plain truth. Perhaps his words may be of interest to fire department officials of other cities where the "penny wise and pound foolish" method of conducting the fire service is in vogue.

"Municipal Engineering" is so strong in its aversion of the League of American Municipalities that it never hesitates to publish false and misleading statements about the affairs of the organization. Its report of the recent Detroit convention is just the sort of a false and misleading story that should be expected from a paper that has spared no effort to discourage the formation and growth of the League. "Municipal Engineering" argues that the League should not exist because it conflicts in its work with the American Society of Municipal Improvements. As a matter of fact the League, one year old, has over 3,500 city officials on its membership roll, and the A. S. M. I., four years old, has just 182 individual members, nearly all of whom are city engineers. We cannot deny the fact that the A. S. M. I. is doing good work, but the younger and stronger organization, through its bureau of information, is doing better work. So, if there is serious conflict between the two organizations, which we doubt, it would be well for the larger and more active one to absorb the other. Mohammed had to journey to the mountain, you know. The League of American Municipalities has the support of practically all of the daily newspapers of the United States; it never will have the support of "Municipal Engineering" and the Trinidad-Bermudez asphalt trust. It is interesting to note, in this connection, that about one-fifth of the total advertising space in "Municipal Engineering" is owned by the Trinidad-Bermudez asphalt trust.

A valuable lesson on the subject of asphalt paving is presented by the experience of the city of Newark, N. J. Until the present season Newark had been paying in the neighborhood of $2.50 per square yard for asphalt paving. As the result of adopting new specifications, under which competition for the contracts is allowed, asphalt streets of the best quality are now being made in Newark for $1.38 and $1.39 per square yard. The contracts let at these figures were divided between the New Jersey Asphalt Co., using California Alcatraz, and the Barber Asphalt Co., using Trinidad Pitch Lake. The new specifications for asphalt paving in Newark are probably the most complete of any used in the United States. They require the most careful and scientific workmanship on all parts on the improvement, from the excavation and curbing up to the wearing surface. Although the specifications cite Trinidad Pitch Lake asphalt as a standard, bids are accepted from contractors using all other asphalts of

equal quality. An important provision of the specifications is as follows:

Whatever may be the character of the asphalt used, or the manner of manipulation and laying, the pavement obtained must be the same or equal to that resulting from the use of the Standard mixture as described, and shall conform to the following general requirements: The pavement, when laid, shall not be so soft as to be unfit for travel on the hottest days of summer, nor so hard as to disintegrate from the effects of frost. When laid it shall be equal in consistency, surface, durability and other properties to the pavement obtained with the Standard mixture. It shall contain no water, or appreciable light oil, and matter volatile at a temperature under 250 degrees F.; it shall yield, when extracted with bisulphide of carbon and after evaporation of the solvent, not less than nine nor more than twelve per cent. of substance, which shall have the same properties as the substance extracted, in a like manner, as obtained from the pavement made of Trinidad Pitch Lake asphalt, namely: heavy petroleum, residuum and mineral matter, in accordance with the foregoing specifications, or properties which shall be equal or superior thereto. The extracted bituminous matter shall have a fire test of 350 degrees F., and shall not possess any marked acidity of potash.

The specifications provide that if any other kind of asphalt than Trinidad Pitch Lake is intended to be used, or if the bidder has not laid any asphalt pavements in Newark before, the bidder must file a statement, under oath, naming the city or cities in which the particular kind of asphalt he intends to use has been used; the statement also to show that he has been regularly engaged in the business of laying asphalt pavements such as he proposes to put down, or is reasonably familiar therewith, and is fully prepared with the necessary capital, materials and machinery to conduct the work which is to be contracted for. Such bidder must also deposit with the city engineer, at least five days before the time advertised for receiving bids, samples of the materials to be used by him. The Newark specifications provide for a ten-year guarantee, the legality of which is not likely to be questioned. Under the contract the pavement is guaranteed to be in good repair for the first five years after its acceptance by the city, and for the succeeding five years the contractor is required to keep the pavement in repair at a standing price of 25 cents per square yard. This 25 cents per square yard for maintenance and repairs is paid to the contractor each year at the rate of five cents per yard per year, and is taken from the general repair fund of the city. Thus the tax-payers, who are assessed for the first cost of the pavement, are not required to pay for its maintenance during the second five-year term of the guarantee. It should be clearly understood that the 25 cents per square yard paid for maintenance and repairs during the second five years of the guarantee period is extra compensation to the contractor, not being included in the first cost of pavement. This is a clever way in which to secure a ten-year guarantee without assuming the risk of having it declared illegal by the court on the ground that the cost of maintenance and repairs of streets cannot be assessed against the property owners with the first cost of pavements.

Paving specifications throughout the country have been undergoing important revision during the past two years. As a result of the campaign of education inaugurated and pursued by this paper, many city officials have learned that in order to secure a first-class asphalt pavement it is not necessary to do business with the trust, and they have, therefore, caused specifications to be revised so as to make competition for paving contracts possible. Every important city in the United States has now broken away from the monopolistic specifications, and in every case the result has been better pavements at lower prices. The season now closing has neither been profitable nor pleasant for the trust people. They have to do business in a fair, open market, meeting competitors like the Alcatraz Company, of San Francisco and New York; the Assyrian Asphalt Co., of Chicago; the Columbia Construction Co., of New York, and the Ayers Asphalt Paving Co., of Zanesville, Ohio. These four companies compete with each other and with the trust, and for that reason their names are published here. The asphalt product of all of these companies has been successfully used for street paving in a great many cities.

The entire board of electric light commissioners of Bay City, Mich., resigned on August 15. They sent a very tart letter of resignation to the board of aldermen, in which they directly charged the legislative body with having turned the municipal lighting plant into a political machine. According to the light commissioners, the aldermen have practically taken the management of the plant into their own hands, located street lights for political rather than illuminating purposes, and used the patronage of the department "as rails in their political fences." One alderman is accused of ordering a light placed in the middle of the block in front of his house, while neglecting places in need of illumination. The light commissioners, in their letter, say that an enormous increase in expenses must necessarily result from the aldermen's management of the plant, and for this they decline to be responsible. After the letter had been read in council, one of the aldermen promptly moved to accept the resignation of the commissioners, stating that he considered the letter an insult to the council. Most of the other members of the council also felt insulted, as the resignation was accepted by a vote of 17 to 4. The Bay City municipal light plant was installed in 1887, and it has a creditable record. According to the last published report of the commission, the plant furnished arc lights, burning 2,623 hours, at a cost of about $63 per year each. Just what effect the interference of the aldermen will have upon the financial showing of the plant remains to be seen. Perhaps they can manage to secure as good results as were obtained by the work of an independent commission, but we doubt it.

"Fire and Water" says that the attendance at the Detroit convention of the League of American Municipalities was meagre, and the papers read "were not conspicuous either for originality or brilliancy." As a matter of fact, there were over 800 officials in attendance—just about four times as many as ever attended any other municipal convention on this continent. Intellectual men like Judge Hillyer, of Atlanta; Mayor Jones, of Toledo; Mayor McMurray, of Denver; Mayor Phelan, of San Francisco; Mayor McGuire, of Syracuse, and Dr. Kohnke, of New Orleans, are not likely to be disturbed by having their papers pronounced lacking in originality and brilliancy by such an insignificant authority as the "Fire Water" editor.

Mayors Pierce, of Marshalltown, MacVicar, of Des Moines, Fullen, of Muscatine, Redmund, of Cedar Rapids, and Stebbins, of Iowa City, have issued a call for a meeting of Iowa city officials at Marshalltown on October 12 and 13. The purpose of the meeting is to organize a state league of municipalities, to be subordinate to the national organization, and to direct its efforts principally to securing state legislation beneficial to the cities of Iowa.

"There are many reasons why such an association would be of great benefit," says the call. "Such an association could look after legislation that is of mutual interest to Iowa municipalities, and the cities and towns, through such an organization, could obtain much-needed legislation The interchange of ideas and experience would be of great assistance to all. Practical questions of interest to every municipality in Iowa could be discussed and the cities receive the benefit of such discussion."

WATER DEPARTMENT ITEMS.

—At Milwaukee a committee of the council have been trying to equalize water rates, and their investigation has brought to light some very interesting and significant facts. For instance, the metered consumers, about 21,000 in number, used approximately 320,000,000 cubic feet of water in 1897. Unmetered users, numbering about 9,000, used 549,000,000 cubic feet. In other words, the metered users averaged 15,238 cubic feet each per annum, while the unmetered users averaged 61,000 cubic feet each, or four times as much as the metered consumers. The metered consumers paid $245,982.08 for water, while those unmetered paid $125,242.94, or about one-half, although they used 230,000,000 cubic feet more water. Or, in other words, the metered consumers use 28 per cent. of the water, and pay 61 per cent. of the costs of the water department, while the unmetered users use 48 per cent. of the water and pay 31 per cent.

—Supt. Charles E. Bolling, of the Richmond, Va., water works, in his annual report, says: "The quantity of water sold through meters was equal to 8.34 per cent. of the whole quantity pumped, and the amount of money received was equal to 22 per cent. of the whole receipts; the average rate received per 1,000 gallons was 9.51 cents. This quantity of water added to that used by the city in its departments, etc., estimated at 20 per cent. of the whole quantity pumped, leaves the balance of water sold and wasted 2,870,776,797 gallons, and the rate received for this was 3.62 cents per 1,000 gallons. The appropriation of $15,000 made by the council was expended in the purchase of 1,652 meters. The purpose of setting the meters was to check the waste at the low points of the high service, where the pressure was greatest, and thereby increase the pressure at the high points, and give consumers water to their fixtures, who for many years have been without it during the day. They have been placed at these points, irrespective of ward boundaries, and have been set in every ward in the city. The results have been most gratifying. All complaints for want of water have ceased, and the increase in the rise of water at the high points amounts to 12¾ feet. Illustrative of the great waste the average saving from 200 taps—the first to be metered—was 12,000 gallons per tap, or supply, per month. Some of the instances of waste were amazing. For example, at one private residence, having only a hydrant and closet, the consumption was 145,000 gallons per month. The bill by ordinance, per month, at this place was 67 cents, or less than half a cent per 1,000 gallons. After the meter was placed the consumption at this residence was 2,000 gallons per month."

—The annual report of the Richmond, Va., water department for 1897 shows that the receipts amounted to $155,746.18, allowing $20,473.94 for water used by the city and granted free. The total expenditures, including extensions, repairs and operation, amounted to $58,963.13.

—The proposition to have the city purchase the plant of the Des Moines, Ia., water company for $850,000 and other considerations was defeated at a special election held on August 29. Only about 7,500 votes, including over 2,200 cast by women, were cast, while the ordinary registration of the city is over 15,000. It is claimed by the champions of municipal ownership that the proposition was defeated by the votes of those who prefer to have the city build a new plant rather than buy the old one from the private company. Mayor MacVicar and three of the four local daily newspapers supported the proposition to buy out the company. Since the election the mayor has announced that he will continue the fight for municipal ownership of water works.

—J. D. Capron, of New Orleans, has invented a new mechanical water filter, in which cloth, without chemicals or other auxiliary aid, is used as the filtering medium. A company has been organized to handle the invention.

—One of the most interesting documents recently issued in the annual report of the State labor commissioner of Kansas, giving a comparative statement as to the cost to consumers of water supply furnished by municipal and private corporations. The figures are based on official reports from twenty-six municipal plants and thirty-two private plants, and present an exhibit both instructive and interesting. The following are the comparative rates:

	Private plant.	Public plant.
Average yearly rate for five-room house	$6 16	$5.00
Average for ten-room house	9.46	8.00
Average, per lot, for sprinkling	7.30	4.31
Rate per foot front	.17	.10
Meter rate per 1,000 gallons	.78	.27

—The people of Atlanta, Ga., will on October 5 vote on the question of issuing bonds to the amount of $200,000 for the extension of the water works. Mayor Collier favors the bond issue.

STREET BOXES FOR WASTE PAPER.

Large sheet iron waste paper boxes are now being placed on the streets of Chicago. Painted conspicuously on each box is this notice:

CITY BOX FOR WASTE PAPER.
LIFT THE LID.

The boxes are placed on the streets, and are cared for by the Clean Street Co., under contract with the city. The company is to receive for the first five years 20 per cent. of the gross receipts for advertising displayed on the boxes, and for the second term of an equal period 25 per cent. Advertising may be displayed on all parts of the box except that bearing the notice mentioned above. The Clean Street Company is required to make a report to the city January 10 next, and every year thereafter during the life of the contract. The city is also permitted, by terms of the contract, to examine the company's books. The boxes are to be distributed throughout the city.

CLEANING CATCH-BASINS.

There are over 6,000 catch-basins in the sewerage system of Milwaukee. All of these have to be cleaned out, as sediment accumulates at the bottom. Some are cleaned twice a month and some twice a year. This is done now in a primitive manner, with buckets, a shovel and a dirty wagon. It is a slow process and somewhat costly. Commissioner of Public Works Bush, who has charge of sewerage matters, is interested in a new process and will take steps to inaugurate it here. He has been looking at the Decarie automatic catch-basin cleaner and thinks well of it. This is a truck, something like the chemical fire engines in appearance. It carries a large iron tank, which is air tight. Two air pumps are driven by an eccentric from the rear axle, as the wagon is driven along the street, and they exhaust the air from the tank and create a vacuum. A five-inch suction hose with a bell-shaped mouth is attached to the tank. This hose is put into the catch-basin and in a minute or two it draws into the tank all the sediment in the basin. Air is prevented from getting in until the work is done, by the water over the sediment. One of these wagons costs about $2,000. They are clean and quick, and if one is purchased it will remove the unsightly sewerage wagons which stand at busy corners for hours sometimes. The Decarie wagon is made in Montreal. A few American cities have tried them.—Milwaukee Wisconsin.

WATER RATES, AIR LIFT TESTS, ETC.

BY F. A. W. DAVIS, VICE PRESIDENT OF THE INDIANAPOLIS WATER COMPANY.

Having occasion to examine the domestic water rates charged in some of the principal cities of the various States, I found Buffalo, Detroit and Minneapolis were very low. An examination of their respective reports made it quite apparent that the cities mentioned have made a rate that will be difficult to maintain. Yet, they may do so. The results are given with the hope that some discussion may be had as to the actual value of the service rendered.

The report of Detroit shows that their actual expenditures were $397,448.04, less the deductions of $6,231.82, leaving $391,216.22 net. While making an estimate on the basis of these figures, it should be noted that one hundred thousand dollars of actual expenses was to pay off bonds. The report shows that their pumpage product was 12,928,821,326 gallons, and the cost was $391,216.22. Dividing the $391,216.22 by 12,928,821,326, we find that the cost per thousand gallons is 3.026 cents. Referring to their meter rate, we find that over fifteen thousand gallons per month is, per thousand gallons, 1.25 cents. Yet the cost of producing water is shown, as above, to be 3.026 cents. The entire pumpage, if sold at 1.25 cents per 1,000 gallons, their lowest rate, would produce $161,610.26. Allowing that the one hundred thousand dollars used to pay off bonds was a profit, and deducting that sum from the $391,216.22, would leave $291,216.22, and making the same calculation as above, we find that the cost per thousand gallons is 2.25 cents.

In the domestic rates we find that for a 30-foot lot where hose is used, the charge is sixty cents a year. In the report of 1896 we find a statement that it was shown by tests that sprinklers used from from four to thirteen barrels of water per hour. The average would be about eight and a half barrels per hour. At forty gallons per barrel, would be three hundred and forty gallons. Estimating that the average sprinkler is used one and a half hours a day, we have five hundred and ten gallons per day. Six days in a week would be 3,060 gallons for the week. Counting four weeks to the month, this would give 12,240 gallons per month. This water, at five cents a thousand gallons, highest rate, would be sixty-one cents a month. For six months would be $3.66. It would, therefore, appear that sixty cents is inadequate for a service that is uniformly recognized as an abused and wasteful service.

The charge to manufacturers for the same quantity of water would be $3.66. On what theory could we furnish water for sprinkling service for less than we furnish it to manufacturers and other users by meter measurement.

It is further noted that the estimated receipts for this year will be $227,395.00; taking the expenditures, $292,216.22, being the actual expenses less the bonds paid off, there would be a deficit of $63,821.22. It seems, therefore, that it will be necessary to add to the amount of the tax levy, which was $74,831.01, the deficit of $63,821.22, making a total tax levy $138,652.23.

It is expected to make the property owners pay for extensions. However, there are connected with every department some extensions of lines, increase in size of mains and purchase of new machinery with which property owners cannot be chargeable, and it seems that these requirements have to be provided for through a general tax, basing our statement on the figures given. This brings us to the proposition whether or not it is fair to level a general tax to give water consumers low rates. There is no question but that every city should levy a tax to be paid to the water department because of the general service, such as applying water to put out fires, cleansing sewers, and other uses of water for the public. What such services are worth requires some consideration. The city received $74,831.01 for water furnished as mentioned above. The city in this case does not furnish fire protection, but furnishes water for the fire department, which must be provided with steamers to do the work of putting out fires. If the tax for such purposes is largely increased, the question arises, are the water rates as low as they appear to be? A greatly increased general tax makes it hardly fair to the non-consumer of water. It is certainly manifestly unjust to water takers to charge rates that produce sufficient revenue to support the whole department. On the other hand, it is hardly just to reduce rates so that the man who has non-productive property must be taxed higher in order to give the water consumer a very low rate. This same proposition seems especially unfair when the tax is based upon valuations. A man may have a very large residence and not be a large consumer of water, which is furnished at a low rate, but his general tax may make his rate high.

In the Buffalo report, 1896, not having the 1897 report, we find that this city is supplying water at a low rate, and to make up a deficit that would occur in the water department, she is levying a general tax to pay for hydrant service and other public uses. The city's report, 1896, shows that the city had a deficit of $525,164.07. To cover this deficit, bonds were issued. The new rate which has been established will make an estimated reduction of 30 per cent. The gross receipts of 1896 were $641,807.56; taking 30 per cent. from this sum, $192,542.26, leaves $449,265.30. The salaries were $126,379.87; fuel, $92,258.56; interest on bonds, $158,779.25; repairs and maintenance, $57,471.40; total, $434,889.08; leaving a balance of $14,376.22 for extensions, alterations, repairs and new machinery. It would seem that this city will be obliged to levy a greater tax than it has in the past for the requirements mentioned, or increase the bonded indebtedness. Their pumpage was 37,287,373,450 gallons, and estimating that it cost to produce the water $435,139.07, we find that the cost per thousand gallons is 1.166 cents, and the lowest meter rate two cents.

The city of Minneapolis charges $1.30 per foot when the mains are laid, being 65 cents each side. There is also paid by tax levy the interest on the water debt. The cost of the works is given as $4,565,915. This sum, at the rate of interest which is now being paid on the water bonds, is $199,530.39; the operating expenses were $99,809.99; total cost, $299,339.98. Taps in service, 14,349. Taking the above sum and applying to each tap makes the annual cost, per tap, $20.86. The revenue received was $211,590.00. This applied to each tap would be $14.74, making a deficit, per tap, of $6.12.

A house of five rooms is scheduled at $1.80, but it does not seem that this is the actual cost. To this we add the interest, 6 per cent., upon $19.50, the amount invested for pipe for a 30-foot lot, which is $1.17, making the cost $2.97, instead of $1.80.

It must be clearly understood that there is no disposition whatever to criticise the rates or business methods of cities named. The reductions and changes are such that the results will be noted with very great interest, especially in view of the appreciation of the value of water resulting from expensive purification methods that must be generally adopted. There is no question but that just and equitable charges should be made to the city and citizens, but to arrive at them, direct and indirect charges should be taken into consideration.

ELECTROLYSIS.

During the past year we have had one service destroyed by electrolysis which was not very far away from the street railway company's power house. In attempting to remove the meter in the power house to repair it, we found a very strong current of electricity. So much so, that we regarded it as dangerous, and had the current tested. This test showed fifty volts. The water company will, during the season, test its entire system to find the electrical condition of its mains.

SNOW PUMPING ENGINE.

Owing to a great number of inquiries concerning the Snow steam engine, I respectfully report as follows:

Size, 29 inches and 52 inches and 80 inches by 33 inches by 60 inches.

Capacity, 20 million gallons in twenty-four hours against a domestic pressure of 80 pounds and a fire pressure of 150 pounds per square inch in direct service.

Piston speed, 215 per minute, or 21½ revolutions.

Total weight of engine, two million pounds.

Pump-end horse-power developed when pumping 20 million gallons in twenty-four hours on fire pressure, about 1,250.

Height of engine above engine-room floor, 33 feet 3 inches.

Height of engine below engine-room floor, 20 feet 6 inches.

Total height, 53 feet 9 inches.

Extreme horizontal dimensions of engine, 31 feet 6 inches by 56 feet 8 inches.

Two fly wheels, 20 feet in diameter, each weighing 57,000 pounds.

Main shaft, journals, 19 inches diameter by 32½ inches.

Diameter in wheel pits, 22 inches.

Crank pins, 12 inches diameter by 12 inches long.

Crosshead wrist pins, 10 inches diameter by 11 inches long.

Connecting rods, 12 feet 6 inches centre to centre of pins, 7½ inches diameter in necks, 8¾ inches diameter in centre of body.

Crank discs, 7 feet 2 inches outside diameter.

Diameter of piston rods, H. P., 6 inches—I. P., 6½ inches—L. P., 7½ inches; one rod to each cylinder, packed with United States metallic packing.

Main crossheads, steel castings, each weighing 7,800 pounds.

Crosshead guide shoes, 46 inches long by 18 inches wide.

Each crosshead is connected to the plunger spider through four steel rods, 5½ inches diameter by 24 feet long.

Weight of each upright frame, 74,000 pounds.

Weight of each main bedplate, 95,000 pounds.

Pump valves are in separate valve chambers placed outside of foundation piers, so that any part can be removed without disturbing other parts.

There are 1,080 pump valves 4 inches in diameter in the chambers, making 180 suction and 180 delivery valves to each plunger, giving a net valve area of 118 per cent. of the area of the plunger.

Delivery main is 36 inches in diameter.

Suction main is 42 inches in diameter.

A surface condenser containing 1,260 square feet of tube surface is placed in a by-pass from the main suction pipe, and so arranged that any percentage of the water can be deflected through the condenser tubes.

Low pressure exhaust pipe, 20 inches diameter.

High pressure steam pipe at engine, 7 inches diameter.

Main steam line, 10 inches by 12 inches in diameter.

Steam cylinders and receivers are lagged with sheet steel casing three-sixteenths of an inch thick.

Air pump is of the attached single acting type, size, 12 inches by 60 inches.

A bedplate 24 inches deep, and weighing 62,500 pounds, forms a base for the three pump cylinders.

A suction chamber and bedplate extends under all six valve chambers and forms a base for the same. It weighs complete 101,000 pounds.

An hydraulic elevator runs from the engine room floor to the intermediate and upper platforms.

Each cylinder is fitted with a wide range Corliss cut-off gear, permitting steam to be cut off in any cylinder at any part of the stroke.

The engine has been in service several months, does work with great ease and economy, and shows 154,812,450 foot pounds duty. The engine is well proportioned, strong and massive. We believe that no better engine has been built thus far.

TEST OF LIFTING WATER FROM WELLS WITH AIR.

Size of well.....10 inches
Depth of well.....330 feet
Depth of water above the end of air pipe.64 feet 4 inches
Outlet of discharge pipe above water in well..
25 feet 8 inches
Lift .....25 feet 8 inches
Tank used—Dimensions, length.....21 feet 5 inches
width .....5 feet
depth .....2 feet 6 inches
Capacity—cubic feet.....267
gallons.....2,002.59
Length of air line in well.....90 feet
Including three feet of perforations.
Size of air line.....2½ inches
Air pressure on meter.....36 pounds
Meter used, Wilie Proportional Gas Meter.....6 inches

First Test.

Time to fill tank .....2 min. 19½ sec.
Cubic feet of air used.....152
Air pressure on meter.....36 pounds

Second Test.

Time to fill tank..... 2 min. 12 sec.
Cubic feet of air used.....150
Air pressure on meter.....36 pounds

Third Test.

Time to fill tank.....2 min. 16 sec.
Cubic feet of air used.....146
Air pressure on meter.....36 pounds

Fourth Test.

Time to fill tank.....2 min. 21 sec.
Cubic feet of air used.....140
Air pressure on meter.....37 pounds

Fifth Test.

With shorter air pipe, 2½ inches.

Length of air pipe .....67 feet
Depth of water above end of air pipe....41 feet 4 inches
Air pressure on meter.....46 pounds
Quantity of water required to fill tank.....2,002.59 gals.
Time to fill tank.....2 min. 46 sec.
Cubic feet of air used.....255

Sixth Test.

Time to fill tank.....3 min. 35 sec.
Cubic feet of air used.....240
Air pressure on meter.....46 pounds

Seventh Test.

With longer pipe.

Length of air pipe.....110 feet
Depth of water over end of air pipe....80 feet 8 inches
Outlet of discharge pipe above water in well..
27 feet 4 inches
Air pressure on meter.....44 pounds
Quantity of water required to fill tank.....2,002.59 gals.
Time required to fill tank.....1 min. 53 2-5 sec.
Cubic feet of air used.....100

Eighth Test.

Time to fill tank.....1 min. 50 1-5 sec.
Cubic feet of air used.....101
Air pressure on meter..... 44 pounds

Ninth Test.

With length of air pipe further increased.

Length of air pipe.....129 feet 4 inches
Depth of water over end of air pipe....102 feet 2 inches
Outlet of discharge pipe above water in well..
27 feet 2 inches
Air pressure on meter.....50 pounds
Time required to fill tank.....1 min. 35 sec.
Cubic feet of air used.....100

Tenth Test.

Air pressure on meter.....43 pounds
Time to fill tank.....1 min. 45 sec.
Cubic feet of air used.....100 pounds

Eleventh Test.

Air pressure on meter.....43 pounds
Time to fill tank.....1 min. 43 sec.
Cubic feet of air used.....100

Twelfth Test.

Time to fill tank.....1 min. 45 sec.
Cubic feet of air used.....100

Thirteenth Test.

Air pressure on meter.....44 pounds
Time to fill tank.....1 min. 37 sec.
Cubic feet of air used.....100

Water below discharge pipe.....27 feet 4 inches
Time to fill tank.....1 min. 48 sec.
Air pressure on meter.....43 pounds
Cubic feet of air used.....99

Seventeenth Test.

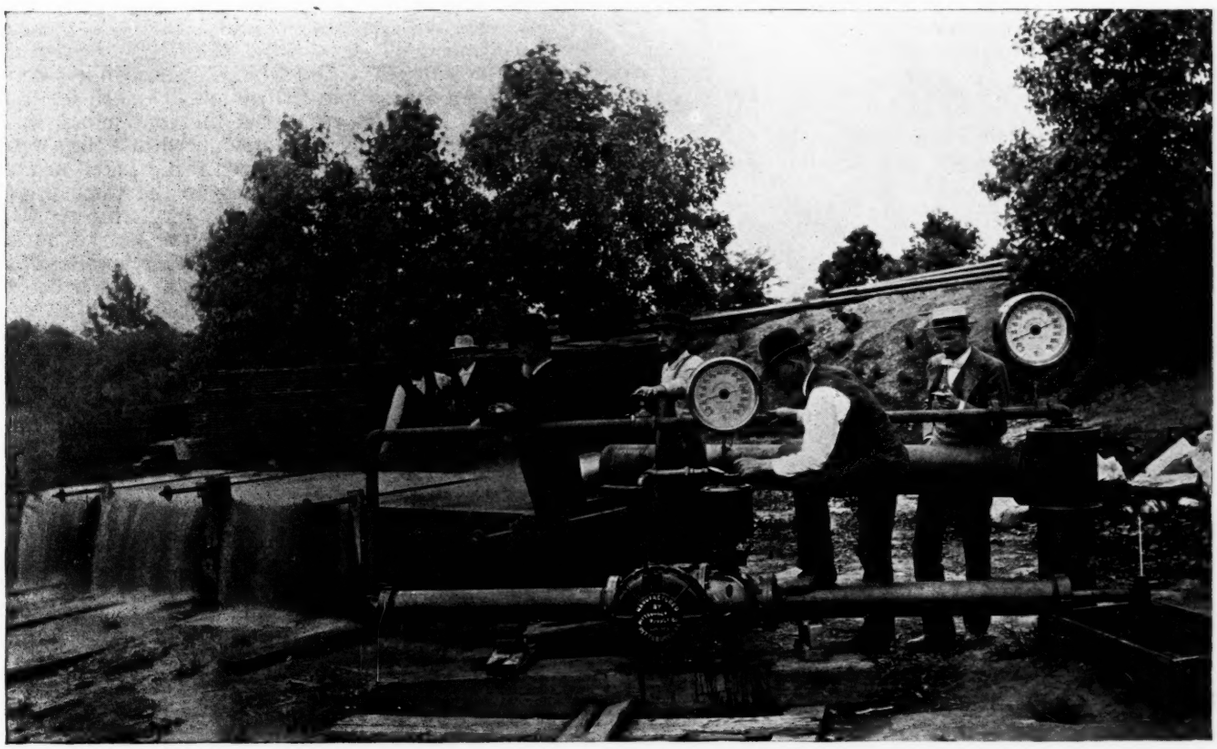
Air pressure on meter.....46 pounds
Time to fill tank.....1 min. 47 sec.
Cubic feet of air used.....96

The tests show that the best results were obtained with 129 feet 4 inches of 2½ inch air line, with three feet of perforations.

Temperature at the discharge pipe of the compressor varied from 176 to 177 degrees.

Temperature of discharge pipe at well varied from in all tests 76 to 78 degrees.

Average time in filling tank .....1 min. 44 sec.
Average cubic feet of air used.....100



TEST OF RAISING WATER FROM WELLS BY AIR, MADE AT RIVERSIDE PARK PUMPING STATION OF THE INDIANAPOLIS WATER COMPANY, INDIANAPOLIS, IND., JUNE 4, 1898.

Fourteenth Test.

Air line.....4 inches
Length of air line.....111 feet 1 inch
Depth of water over end of air pipe.....83 feet 7 inches
Outlet of discharge pipe above water in well..
27 feet 4 inches
Air pressure on meter.....45 pounds
Time to fill tank.....1 min. 55 sec.
Cubic feet of air used.....106

Fifteenth Test.

Time to fill tank.....1 min. 54 sec.
Air pressure on meter.....45 pounds
Cubic feet of air used.....107

Sixteenth Test.

Using curve nozzle deflecting air upwards, 2½ inches.
Length of air line.....108 feet
Depth of water over end of air pipe....80 feet 8 inches
Average pressure on meter.....44 pounds
The lift of the water was.....27 feet 2 inches
The quantity of water discharged.....2,002.59 gals.
Weight .....16,676.66 pounds

The short pipe gave the poorest results. The test by the 4-inch pipe was to ascertain if, by reducing the annular space in the tenth, a greater flow of water would be obtained, but the results did not show it.

In all of these tests the temperature varied only from one to two degrees at compressors and at well. Temperature of water as it comes from the well, 54 degrees.

The aeration of the water causes it to precipitate the iron rapidly. The air line was covered to the depth of about 1-16th of an inch in eight months' time.

The tests were made with care, and it is hoped they will be of much value to the water works people. It should be noted that the cubic feet is not free air, but compressed. The cooler the air is introduced into the well, so much the better. The contraction of the volume

of the air occurs when it comes in contact with the cold water and there decreases its effectiveness.

Heat units that will raise the temperature of one pound of water one degree will raise the temperature of one pound of air four degrees.

SUPERIOR'S NEW LIGHT CONTRACT.

A new lighting contract, for a period of three years, has been made by the city of Superior, Wis., with the Wisconsin Water, Light and Power Company. The contracts provides for 150 arc lamps of 2,000 c. p., burning all night and every night, at $80 per lamp per year. In case 225 lamps or over are used, the rate is to be $77.50. The company furnishes 166 incandescent and three arc lights for public buildings free of charge. The contract fixes the rates to be charged by the company for commercial lighting as follows:

ARC LIGHTS.

Standard nominal 2,000 candle-power.

Lamps on same circuit as public lamps, same price as paid by city.

	1st lamp.	Add'l lamp.
Inside lamps on commercial circuit, 10 o'clock lamps per month (six nights per week)	$6.50	$5.75
12 o'clock lamps, per month (seven nights per week)	7.50	6.75
All night lamps, per month (seven nights per week)	8.80	7.95

Outside lamps on commercial circuits (these rates to be made only when light furnished by the company is used inside the buildings exclusively):

10 o'clock lamps, per month	$6.00
12 o'clock lamps, per month	7.00
All night lamps, per month	9.00

INCANDESCENT LIGHTS.

Combination flat and meter rate for resident lighting:

Fixed charge of 5c. per light, per month, for 20 16-candle-power lamps or less.

Meter rates, 6-10c. per lamp hour or 12c. per 1,000 watts.

Consumers to have straight meter rate at 12½c. per 1,000 watts, if preferred.

Contract rates:

Running not later than 10 o'clock, per month, for 16-candle-power lamp, 50 cents.

Running not later than 12 o'clock, per month, for 16-candle-power lamp, 50 cents.

Running not later than all night, per month, for 16-candle-power lamp, 70 cents.

Other rates for arc and incandescent lamps to accord with the foregoing.

No extra charge for meter in any case, and no charge for wiring in making outside connections above actual cost.

THE MILWAUKEE GARBAGE CONTRACT.

If a contract made on September 13 holds good, the municipal garbage plant at Milwaukee will be of the Engel pattern. On the afternoon of September 12 the majority of the committees on health and public buildings and grounds reported to the council in favor of adopting the Dixon system, but the council by a vote of 22 to 19 substituted the Engel system. At midnight on the same day there was a meeting of city officials and the representatives of the Engel Company, at which the details of the contract were arranged, and early the next morning the members of the board of public works affixed their signatures to the contract, which provides for the erection of an Engel furnace on Jones' Island within four months at a cost of $52,500. It is claimed that the council had no legal right to adopt the amended report of its committees before the same received the signature of the city comptroller. On this contention, the legality of the contract made with the Engel Company may be attacked.

The citizens of Milwaukee would doubtless be happy to have any kind of a settlement of the local garbage matter, because they have been wearied by the inexplicable manner in which their council has dealt with the question during the past two years. At one time the council sent a special commission, including Health Commissioner Kempster, on a tour to investigate all the important garbage plants in the country. This commission made a very careful examination of all of the reduction and cremation systems, and reported favorably to the Holthaus system of reduction, whereupon the council adopted a resolution declaring the Holthaus to be the one system desirable for use in Milwaukee. Some time afterward the council rescinded this action, but the mayor vetoed the rescinding resolution on the ground that the members of the council could give no reason for changing their minds on the subject. Meanwhile a contract had been awarded to Crilley & O'Donnell for the erection of a Holthaus plant, but the contractors, in a communication to the council, announced that they were unable at that time to accept the contract. Later on Mr. O'Donnell swore that his signature to the communication rejecting the contract was a forgery; that he was willing and ready to accept the contract and carry out its terms. It is impossible, in this short article, to relate the many complications that ensued. And now, after deciding on cremation and referring the question of which system should be used to its commitees on health and public buildings and grounds, the council makes its own decision regardless of the report of its committee.

MAYOR LEVAGOOD'S SHORT TALK.

When the place of Mayor M. H. Levagood, of Elyria, Ohio, was reached on the programme of the Detroit convention of the League of American Municipalities the noon hour had struck, and as the delegates were both warm and hungry the mayor did not detain them more than a couple of minutes. Mayor Levagood's speech, the shortest of the convention, is given here in full:

Mr. President and Gentlemen:—I think you have heard so much and so well on the water question that I will confine myself to but two points, and I am willing to guarantee that I will not take up four minutes. I want to show you a sample of water, and I believe I am the only mayor who has a bottle with him in his pocket. We have heard something of mechanical filters, and if time would permit I would like to refer to that in my neighboring town of Lorain, but I would like to speak of that sample of water which I have here, from Painesville, Ohio, of which one man said to me: "That is from God's filter." This filter that I speak of is situated on the shore of a lake under the water, so that the washing of the waves carries away all the accumulation. This filter was first constructed by digging a trench I think 800 feet long by two feet wide and from eighteen inches to two feet deep, and it cost but $2 per foot for construction. Since its construction not one cent of expense has been incurred to clean it, because the waves themselves wash away the accumulations. They anticipate for the next ten years it will be no expense. In fact, some of them think the filter is practically perpetual and devoid of expense. That trench is filled with pure lake sand and the water trickles through that sand into a large cistern or trench. This filter furnishes water for some 7,400 people. There are many other questions I would like to discuss, but you are looking forward and your stomachs are craving for something thicker than water, and I therefore will simply thank you for your consideration.

THE "METROPOLITAN" STEAM FIRE ENGINE.

The first "Metropolitan" engine was designed especially for service in the fire department of the city of New York, where the results obtained have led to its ready adoption by many of the larger cities throughout the United States. It is pronounced by experts to be the most advanced and perfect of the piston type of fire engines ever produced. It is built to last, no effort or expense being spared to make it as excellent and efficient and durable as may be possible. Provision is made for taking up in its various parts any wear there may be after years of service, and in every detail the machine is as near perfection as labor and money can make it. The engine is hung on patent equalizing platform-spring rigging in front, and on half elliptic springs in the rear.

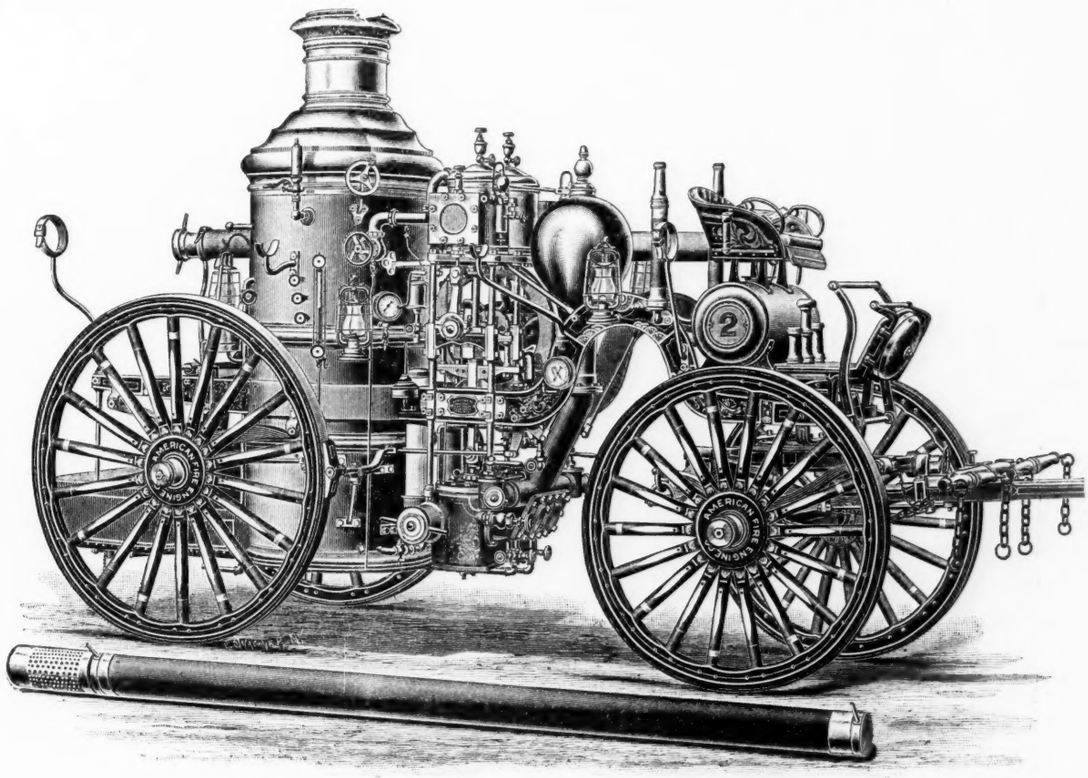


FIG. 1.—THE "METROPOLITAN" STEAM FIRE ENGINE.

Built by the American Fire Engine Company, Seneca Falls, N. Y.

The "Metropolitan" engine is built in six sizes, with pumping capacity ranging from 400 to 1,300 gallons per minute. The largest or "double extra first" size is fitted with a three-horse hitch, in addition to the regular pole for two horses, and any of the engines may be adapted to be drawn by either horses or men. The Fox boiler with which it is equipped is a steam generator of the vertical water-tube type, devised to meet the requirements peculiar to the fire service. It embodies some original ideas as to the arrangement of the tube service, method of circulation and constructive features generally. The boiler consists primarily of a simple annular shell, which constitutes a water-legged fire box and steam reservoir. The shell being entirely devoid of head, crown sheet, smoke flues or other inaccessible complications, this part of the boiler is as permanent as anything that can be devised to serve as a foundation for the support of the active steam-generating units which are attached thereto. The principal heating surface of the boiler consists of straight water tubes, manifolded in sectional form and housed within the above-described shell. All connections are readily accessible, and any one or all of the several tube sections may be withdrawn from the boiler. The advantages of a boiler constructed on such lines are apparent, as the shell need never be disturbed for repairs or renewals of the tube systems. The life of both water tubes and fire tubes is generally found disproportionate to the heavier parts used in boiler construction, and experience shows conclusively that the cost of subsequent maintenance is measured directly by, and may be diminished by, the facility with which these indispensable parts may be replaced or repaired in an emergency. It will be noted that the lower part, or water leg, of the shell is contracted for the purpose of facilitating the rapid generation of steam, and also providing the maximum grate area allowable within the limits of any given exterior diameter. At a point somewhat below the normal water line of the boiler the inner shell is flanged inward, thereby enlarging the annular space between the inner and outer sheets for the purpose of providing a more copious reservoir. The water line being carried in this larger part of the shell tends to prevent the rapid fluctuation of the water level, and the increased area of its surface at this point is favorable to the disengagement of the steam. When held at its normal point the water line fully protects the flanged part of the inner shell; but no damage can occur either from a wilful or an accidental drawing down of the water, as the spray deflected through the nipples of the outer tubes is sufficient to protect the flange, although the actual water level is well down in the leg.

To insure a delivery of dry steam to the cylinders a peculiar "take-off" ring is provided at the highest part of the steam reservoir, the same encircling the inside sheet of the shell. The upper edge of the ring is perforated at a distant point from the throttle, and the steam entering the ring chamber in small streams is held in close contact with the hot shell at a point closely adjacent to the upper line of rivets, being thus effectually dried during its passage to the throttle, and the heat absorbed serves as a protection to the rivets.

The water-tube sections comprise an inner and outer tube system. The outer system embraces the short manifolded sections which completely encircle the fire-box walls. The tubes are "staggered" in their manifolds, thereby exposing the greatest possible surface to the fire, and effectually filling out the space due to the difference in the width of the water leg and steam space of the shell. The direct and fierce application of heat to the tubes causes a natural and active upward current therein, which in turn induces a corresponding downward tendency to the water in the leg of the fire-box, and promotes the flow into the feed pipes arranged to supply the inner system of tubes.

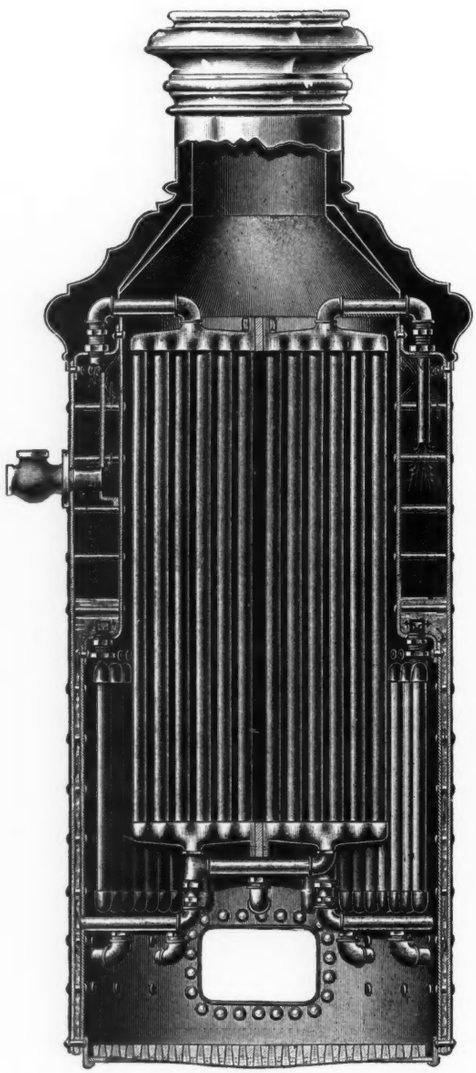


FIG. 2.—VERTICAL SECTION FOX BOILER USED ON "METROPOLITAN" FIRE ENGINE.

The tube sections of the inner tube system extend to the upper limits of the boiler, their number and arrangement being such as to completely fill the interior of the shell above the space allotted and required for the combustion of the fuel. The flat inner end of each upper manifold is rigidly bolted to a heavy transverse beam, which in turn is supported in suitable pockets secured to the upper part of the shell. The flat ends of the manifolds abutting on the beam serve to protect the same from the action of the fire, and all parts of the system are allowed perfect freedom for expansion. The sections opposite one another on the beam are united by a right and left nipple at the bottom, and a single connection to the leg of the fire-box serves to supply both.

At the top of the boiler, each section has its own separate and distinct connection with the steam space, and it is possible to remove either one of the sections separately without disturbing any of the others; or the entire inner-tube system can be raised out of the boiler as a whole, after breaking the proper connections. The current of water and steam carried over through the top connections of the inner system is sufficient to keep the tubes clear of scale; and the point of discharge and disengagement is brought down low to prevent its mixture with the drier steam contained in the highest part of the shell.

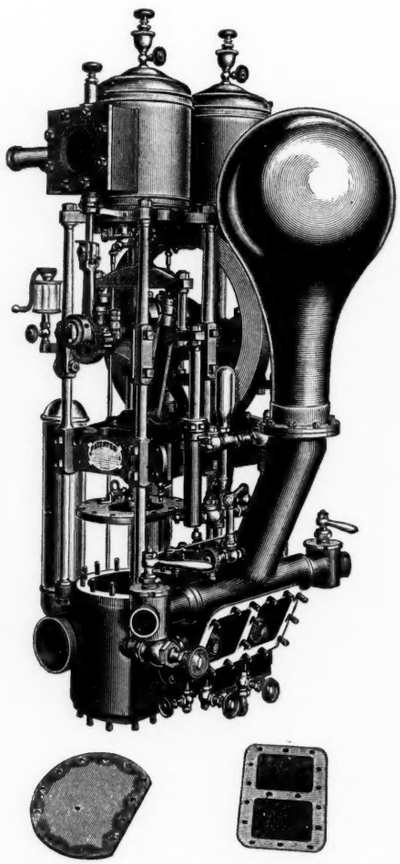


FIG. 3.—"AMERICAN" PUMP USED ON "METROPOLITAN" ENGINE.

The arrangement of the tubes permits fully twenty per cent. more heating surface to be placed within the range of the fire than has been customary in the older forms of boilers; as a consequence, steam is generated freely and firing made easy. The boiler is in no way top-heavy and can be safely operated, standing on any angle, inside the limit necessary to keep it erect; consequently there is no

danger in the shifting of the water line while running over grades or ruts, and the usual delay of leveling up is entirely avoided.

The "American" pump used on the "Metropolitan" comprises two separate and distinct double-acting piston pumps, united in a single body, of a new and improved form. The advantage of thus uniting two pumps in a single casting is the great strength and rigidity obtained. The water ways of the "American" pump are claimed to be the most simple and direct ever placed in a vertical piston pump. Superior facilities are provided for exposing the interior mechanism of the pump, which permits all such parts to be readily reached for renewal or repair without dismounting the entire pump or greatly disturbing its exterior attachments. The valves can be easily and quickly examined, or replaced by simply removing the caps or heads that enclose the chambers. All studbolts, nuts, etc., coming in contact with water are made of drawn phosphor bronze; all nipples, piping, etc., are of brass, and, as a result, the "American" is the only non-corrosive pump now placed on a steam fire engine.

Suction or hydrant connection may be made at either side of the engine; and in operation, the central core of the pump body is practically a continuation of the suction hose, and serves to establish a direct communication with the receiving pump valves, arranged on opposite sides of the chamber. The driving mechanism supplied with the "American" pump is particularly compact and well balanced, and embodies many excellent advantages found in no other type. The steam cylinders are of the ordinary slide-valve type. The valve movement is simple, and there is nothing connected with the steam ends that may not be readily understood at a glance.

FIRE DEPARTMENT NOTES.

—The Pennsylvania State Firemen's Association will hold its annual convention at Lebanon, October 4 to 7.

—The convention of the Virginia State Firemen's Association will be held at Newport News, September 28-30.

—William N. Hubbard, chief of the New Haven, Conn., fire department, died on August 29. He was a member of the New Haven department for twenty-one years, and his record as a fireman is of the highest order.

—After having suffered from a very destructive fire, the citizens of Laurel, Md., have appointed a committee to organize a fire department. The committee is composed of W. H. Diven, C. W. Darr, J. W. Gray, James Federline, T. M. Baldwin, L. A. Ellis, James Scaggs, Clarence Frost, M. J. Tighe.

—The annual report of James Devine, chief engineer of the fire department of Salt Lake City, has been received. It shows that the force of the department comprises twenty-seven officers and men, and that the total expenditures for the year amounted to $29,375.72, of which $23,122.81 was for salaries. There were ninety-three alarms during the year, and the total loss was $122,168.98.

—James R. Elliott, chief engineer of the fire department of Detroit, Mich., died on August 31, after a prolonged illness. Chief Elliott was one of the best known fire fighters in the United States, and his death will be mourned by an extremely large circle of friends. He was appointed chief of the Detroit department in 1895, after having served as assistant chief for nearly twenty years.

DIXON PLANT AT SANTIAGO.

The United States Government has contracted for the construction of a Dixon garbage crematory, with a daily capacity of 25 tons, at Santiago, Cuba. This is the first of about a dozen Dixon plants to be built for the Government.

STREET RAILWAY FRANCHISES.

A reporter at the recent convention of the League of American Municipalities inquired of each city, through its representatives, what it received from the street car companies that occupied its streets, for how long a time the franchise was granted, what control the city reserved over its roads and all other information obtainable regarding the subject. The interviews he secured are given below in condensed form:

Providence, R. I.—Franchise 20 years recently granted, 63 miles tracks, must pave between rails and 18 inches outside. Pays taxes on real and personal property assessed at $1,000,000. Franchise not included in assessment. Company pays 3 per cent. of gross earnings until July, 1898, 5 per cent. for next five years, 6 per cent. for balance of time. Paid city last year $26,750. Grooved rail, cement foundation and continuous "all steel" construction.

Newark, N. J.—Franchise perpetual. Required to pave between tracks and one foot outside "as directed." Franchise not taxed. Taxes assessed on $3,000,000; $10 per year, collected as a "car tax," yielded $3,950; also a tax of 5 per cent. on gross earnings, netting city $68,000 last year. Fare, 5 cents; transfers, etc. No T rail allowed.

Niagara Falls, N. Y.—On late franchises city collects a mileage tax of 1 per cent. per mile car run; $3,500 paid by the company last year. Another road paid $150. All pave between tracks as directed; also pay general taxes on assessed valuations. From another road the city received $3,600 as a mileage tax, and 3 per cent. of 20 per cent. of the gross earnings. This last franchise was sold at public sale to the highest bidder.

Louisville, Ky.—One company has eight franchises, 80 miles of track; must pave as ordered and repave when ordered. If a sewer is built and pavement disturbed company must replace it. Pays taxes on assessment of $1,800,000. Franchise has been assessed at $3,000,000, but question of taxing is in litigation. No license; fare, 5 cents; school children, 2½ cents; complete transfer system. Some T rail used, but mostly groove and girder. Groove best for people.

Logansport, Ind.—Five miles track. Company must keep entire street in repair. Pays taxes on assessment of $50,000.

Omaha, Neb.—Franchise expires in 1928; 64 miles of track. Required to pave as ordered between tracks. Pays taxes on real, personal and franchise; latter assessed at $150,000. No other license. Girder rail on paved streets. T rail allowed on suburban construction.

Charleston, S. C., population 65,000.—Operate under a perpetual charter; 69 miles electric. Pay nothing; received charter "befo' the wah"; obliged to pave as ordered between tracks and 3 feet either side. T rail tried and abandoned.

Evansville, Ind.—Franchise granted 1891 for twenty-five years. Required to pave as directed between tracks. Pays taxes on $200,000 assessed value and 2 per cent. on gross earnings. City received from this $2,700 last year. Girder rail. Some T tried and abandoned.

Hartford, Conn.—Charter granted 1859 perpetual. But 16 miles of track. Real estate owned and not used for railway purposes taxed. Pays 2 per cent. on gross receipts, about $8,000 last year. No other taxes. Uses girder rail. T rail has been used, but now out. Company did not like it; caused too many accidents for which it was held liable.

Kansas City, Mo.—Three companies. Franchises expire in twenty-four years; given for thirty. Ten miles electric; 75 cable. Required to pave between tracks as ordered. Use T rail; pave up snug against rail; the car flange cuts its own groove; said to be satisfactory. Pays $30 per car per year and on an assessed valuation of $1,-

500,000. City got $9,000 last year from car tax. No other tax; fare, 5 cents with transfer privileges.

Alpena.—Uses T rail; finds it fairly satisfactory. Has no control over line.

Erie, Pa.—Requires company to pave as ordered; regulates time and speed. No T rail used. Receives no special tax. Property listed for taxation same as other property. Interurban trains use old rails on agreement with old company.

Minneapolis, Minn.—Has 176 miles electric road. No franchise tax. Expires 1925; granted for fifty years. Car tax, $25 per year, brought $3,775 to city last year. Franchise assessed at a valuation of $125,000; also pays taxes on real estate and personal assessment of over $700,000. No per cent. paid. Must pave as directed. Run cars as often as directed. Speed limited. All groove or girder rail; steel construction.

Des Moines, Ia.—Thirty-one miles electric. Must pave as directed and run cars as often as directed. Assessed for taxation, $150,000. No other tax. Company agreed to pay 5 per cent. of net earnings. Mayor says: "It bonded so excessively that it never has had, and never will have, any net earnings." Makes this suggestion: That in granting future franchises the maximum amount for which bonds may be issued be definitely fixed in franchise.

Toledo, Ohio.—Toledo Traction Company, a consolidation, operates 1,110 miles electric under several franchises which expire in from thirteen to twenty-two years, originally granted for thirty years. Much dissatisfaction among people. Municipal ownership strongly agitated. Paves 7 feet on single, 14 feet on double tracks; pays ordinary taxes on $350,000; no other tax or license. Council controls time and speed. Company has applied for a fifty year franchise, which has been refused. No T rail; all groove or girder. Girder rail has 2½ inch flange, so that wagons can use it. Interurban comes in on old rail by agreement.

Syracuse, N. Y.—Population, 127,000. Charter perpetual; made so over mayor's veto. Council that did it not returned. Pays 2 per cent. on gross receipts or 1-10 of one cent on each pasenger. Must pave between rails and 1 foot outside as directed, usually with brick, as oil rots asphalt. No control over route or time. T rail prohibited by law.

Peoria, Ill.—Population, 70,000. Has 40 miles of trackage. City receives $5,000 per year as tax. Pays regular tax as well. The city has been offered $275,000 for a fifty year franchise. Company must pave and run cars as often as directed. Use girder rail. T rail has been tried; very unsatisfactory.

Augusta, Ga.—Franchise granted for fifty years. No franchise tax; ordinary taxes on $200,000 assessment. Not required to pave at all. Theory being that change from mule power to electricity did not wear the street. Council can order time control; no other control. Transfers. T rail on unimproved streets only.

Columbus, Ohio.—Two companies; one of 60 miles, the other 30. Franchises expire along from time to time in next fifteen years; originally given for twenty-five years. Pave between tracks; one foot outside, as ordered. No special tax. General on $625,000.

Denver, Col.—All narrow gauge (3 feet 6 inches), pays no franchise tax. Franchise, 25 years. Are now applying for extension; offer $2,500 per year for same. Must pave as directed. Uses T rails, which by reason of narrow gauge has not been very objectionable.

Dayton, Ohio.—Four companies. Franchise, fifty years from 1894. Must pave between rails and 18 inches outside as directed by council, usually with brick on concrete. Pays tax on assessment of $300,000. No other tax. Full transfer; girder rail, 2½ inch flange.

Elyria, Ohio.—Population, 10,000. Gets nothing. Franchise, twenty-five years. Must pave as directed. Finds T rail all right.

Terre Haute, Ind.—Population, 50,000. Company pays usual taxes on property; is obliged to pave as directed. Use T rail with nose block; been used six years, and is found to be satisfactory; streets are wide and there is not much travel along tracks.

Saginaw.—Road now in hands of a receiver. Was forced to take this action by council, which insisted that back taxes must be paid and blocked track with steam roller. No rail allowed but grooved in paved section. Had very unsatisfactory experience with T rail—rutted. Principal lines laid on steel ties with concrete foundation; continuous welded rail. No franchise tax. Car tax, $5 per car.

Wilmington, Del.—Population, 70,000. Charter perpetual. Required to pave between rails and for 3 feet outside. Extensions under control. Tried T rail, which is now abandoned. Mayor says: "We have not got the street car system, it has got us." No taxes except ordinary; no other control. Groove and girder rails only.

Cleveland, Ohio.—Railway paves as directed between tracks and 18 inches either side. Time and speed under control. Franchise for twenty-five years. One road may use another's tracks for four blocks on downtown streets, also on viaducts; interurbans come in over old tracks; private arrangement between companies. No T rail allowed; all continuous girder rails on concrete. No new charter will be granted that does not contain tax on gross receipts. Street car companies made liable for accidents by reason of defective pavement between tracks.

New York city.—Franchise must be advertised and sold at public auction to highest bidder. Cannot be given away. Grooved and girder rails only; no T rail allowed in New York State at all. Think it is objectionable. No trouble with grooved rail either with cars or teaming.

Brooklyn.—Same as New York.

Akron, Ohio.—Franchise for twenty-five years. Company must pave as city directs for 14 feet on double and 7 feet on single tracks; fare, 4 cents. No T rail used, except in suburbs; will be replaced, when ordered, with girder. Pays taxes on assessment, same as individuals.

Birmingham, Ala.—Franchise thirty years. Pave between tracks as directed. Rail and time under direction of council. No T rail used on improved streets. Don't like it where it is used. Company pays 1 per cent. on gross income.

New Bedford, Mass.—Population, 65,000. Franchise perpetual; 3 cent fare from 6:30 to 7:30 a. m.; 5:30 to 6:30 p. m. Company pays one-fourth expense of street widening and 2¼ per cent. of gross receipts; removes all snow; paves between tracks and 18 inches outside. Pays license of $5,000 per year. Interurban trains use tracks for compensation to be fixed by commission or at option charge of 5 cents per passenger, less estimated value for use of cars. All full grooved rail; no T rail allowed. Has been tried; not liked; ruts badly.

Bridgeport, Conn.—Population, 75,000. Charter perpetual. Fare, 5 cents; longest ride for single fare, 7 miles. Must pave as directed by common council and for 2 feet each side tracks. Now use girder rail. T has been tried; found very unsatisfactory; ruts. Suburban trains use track of city company by private agreement.

Erie, Pa.—Population, 56,000. Use girder rail. Franchise, twenty-five years. Obliged to pave between rails and for 1 foot outside as directed by council. Time schedule under control; future extensions to use grooved rail.

Meadville, Pa.—Sold franchise. Particulars not obtainable.

Lima, Ohio.—Population, 23,000. Use nothing but T rail; do not find it objectionable, although pavement wore out fast next rail; thought it poor pavement.

Atlanta, Ga.—Population, 100,000. Has 94 miles trackage. The company pays a special tax amounting to $6,000. Much the same conditions exist there as in

Grand Rapids. Old lines being absorbed, etc. Charter twenty-five years. Must pave as directed; use such rail as directed; time schedule as directed. Route as please. All groove rail. T rail tried and abandoned. Worked fairly well on some wide streets.

Detroit.—Uses grooved rail exclusively. Pavement lies up close against it. Late trackage is laid with steel ties with welded joints bedded in concrete. Has 5 cent fare, with partial transfer system. The suburban cars run in over the other tracks (groove) without any difficulty. These rails offer no impediment to vehicles. Mayor Maybury says there were no blockades last winter. Men on the cars insist the cars run better and easier with less delay on groove than on old girder. Two companies. One pays 1 per cent. and the other 2 per cent. of gross earnings.

Nashville, Tenn.—Population, 100,000. Has 55 miles street railway. Franchise perpetual. Road got badly in debt by reason of change from mule power to electric service. The company applied to council for concessions. Were refused; went into hands of receiver and settled its debts. The company pays taxes on an assessed valuation of $150,000, in addition to a car tax of $35 per year. Paves as directed. Uses grooved rail; has tried T rail, found it unsatisfactory. Have a central transfer house through which all cars pass.

Charleston, S. C.—Population, 65,000. Must pave as directed and for 3 feet outside of rail. Use grooved rail; T rail has been tried and abandoned. City has no control over the routing. Has control over speed and time. Receives ordinary taxes.

BACK NUMBERS OF CITY GOVERNMENT.

Back numbers of this paper may be obtained at 25 cents a copy.

TRADING STAMP BUSINESS LICENSED.

Here is an ordinance adopted and in force at St. Joseph, Mo., that ought to be widely copied:

Section 1. No person, or association, or companies of persons, or corporations shall carry on or operate in this city, in person or by agent a "Trading Bank Check or Stamp Concern" without a license for that purpose, and the charge for such license shall be five hundred (500) dollars per year, and no license shall be issued for a shorter period than one year.

Sec. 2. Any person who shall furnish or supply to merchants or others for delivery or distribution to persons purchasing goods, wares or merchandise from such merchant or other person, any stamp, checks or coupons, for a stated number of which premiums or prizes are offered or given in redemption, or any person, merchant, firm, association of persons or corporation that shall furnish his or its own stamps, checks or coupons to persons so purchasing goods, wares or merchandise from such person, merchant, firm, association of persons or corporation for a stated number of which premiums or prizes are offered or given in redemption, or any person who manages, conducts or maintains a room or place for exhibiting goods, wares or merchandise or samples of goods, wares or merchandise offered or given in exchange for such stamps, checks or coupons, is hereby declared to be the operator or manager of a "Trading Bank Check or Stamp Concern."

Sec. 3. Any person who shall violate Section 1 of this ordinance shall, upon conviction, be fined two hundred dollars for each offense, and each day that such person conducts or operates a "Trading Bank Check or Stamp Concern" without a license shall constitute a separate offense.

DIRECTORY OF MUNICIPAL ORGANIZATIONS

League of American Municipalities.

President—Samuel L. Black, Mayor, Columbus, Ohio.
Vice-President—Wm. C. Maybury, Mayor, Detroit, Mich.
Treasurer—Thos. P. Taylor, Mayor, Bridgeport, Conn.
Secretary—B. F. Gilkison, Downing Bldg., New York City.
Trustees—John MacVicar, Mayor, Des Moines, Ia.
Charles S. Ashley, Mayor, New Bedford, Mass.
J. Adger Smyth, Mayor, Charleston, S. C.
Next Convention—Syracuse, N. Y., 1899.

International Association of Fire Engineers.

President—A. J. Kennedy, New Haven, Conn.
Secretary—H. A. Hills, Wyoming, Ohio.
Treasurer—D. C. Larkin, Dayton, Ohio.
Next Convention—St. Louis, Mo., Oct. 18-21, 1898.

American Water Works Association.

President—Joseph A. Bond, Wilmington, Del.
Vice-Presidents—William R. Hill, Syracuse, N. Y.
Charles P. Allen, Denver, Col.
L. N. Case, Detroit, Mich.
John B. Heim, Madison, Wis.
R. L. Clayton, Atlanta, Ga.
Secretary-Treasurer—Peter Milne, Brooklyn, N. Y.
Next Convention—Columbus, Ohio, 1899.

National Association of Chiefs of Police.

President—J. T. Janssen, Milwaukee, Wis.
Vice-President—W. G. Moore, Washington, D. C.
Secretary—Harry O. Carr, Grand Rapids, Mich.
Next Convention—Chattanooga, Tenn., 1899.

American Society of Municipal Improvements.

President—Harrison Van Duyne, Newark, N. J.
Vice-Presidents—L. W. Rundlett, St. Paul, Minn.
E. H. Keating, Toronto, Canada.
A. D. Thompson, Peoria, Ill.
Secretary—D. L. Fulton, Allegheny, Pa.
Treasurer—John L. Kennedy, Nashville, Tenn.
Next Convention—Washington, D. C., October 26-28, 1898.

American Public Health Association.

President—Dr. Charles A. Linsley, New Haven, Conn.
Vice-Presidents—Dr. Benjamin Lee, Philadelphia, Pa.
Dr. J. C. Schrader, Iowa City, Ia.
Secretary—Dr. H. C. Probst, Columbus, Ohio.
Treasurer—Dr. H. C. Bolton, Brattleboro, Vt.
Next Convention—Ottawa, Canada, September, 1898.

National Street Lighting Association.

President—D. Hunter, Jr., Allegheny, Pa.
Treasurer—C. E. Thompson, Binghamton, N. Y.
Secretary—Charles E. Burton, New Haven, Conn.
Asst. Secretary—C. F. Roberts, New Haven, Conn.
Next Convention—Binghamton, N. Y.,

Association of Fire and Police Telegraph Superintendents and Municipal Electricians.

President—J. W. Aydon, Wilmington, Del.
Vice-President—G. F. Macdonald, Ottawa, Canada.
Corresponding Secretary—H. F. Blackwell, New York.
Financial Secretary—Burt McAllister, Bradford, Pa.
Treasurer—Adam Bosch, Newark, N. J.
Chairman Executive Committee—W. Y. Ellett, Elmira, N. Y.
Next Convention—Wilmington, Del., 1899.

National Firemen's Association of the United States.

President—F. A. Wood, Cedar Rapids, Ia.
Secretary—E. W. Barkman, Decatur, Ill.
Treasurer—H. S. Salisbury, Whitewater, Wis.
Next Convention—Chicago, Ill.

TRADE NOTES.

—New York city has just contracted with Manchester Locomotive Works for one-fourth size Amoskeag steam fire engine.

—The Lower Brick Company, Sioux City, Ia., has been incorporated by W. B. Lower, S. R. Clarke, E. W. Rice and A. L. Steison.

—The New Castle Block Asphalt Company, New Castle, Pa., contemplates the establishment of a branch factory in Sandusky, Ohio.

—Pittsburg, Pa., has contracted with Manchester Locomotive Works to rebuild Engine No. 16 with one of their latest improved Amoskeag boilers.

—Lowell, Mass., has contracted with Manchester Locomotive Works to rebuild a steam fire engine with one of the latest improved Amoskeag boilers.

—The Bacon Air Lift Company, 100 Broadway, New York, make a specialty of artesian well water supply, utilizing compressed air as the motive power for pumping.

—Boston, Mass., Easton, Pa., and Waltham, Mass., have contracted with Manchester Locomotive Works to rebuild steam fire engines with their latest improved Amoskeag boilers.

—The South Bend Portland Cement Company, South Bend, Ind., has been incorporated. The directors of the company are John Lux, Chas. H. Atkinson, Aman Moore and Lee W. Atkinson.

—The Rincon mines of the Alcatraz Asphalt Company, which are situated about eight miles from Santa Barbara, Cal., have resumed operation, and will be extended as fast as conditions will allow.

—The fire commissioners of Duluth, Minn., have just purchased 1,000 feet of cotton hose from the Chicago Fire Hose Company, and a like amount from the New Jersey Car Spring and Rubber Company.

—The Assyrian Asphalt Company, of Chicago, have issued a very neat pamphlet calling attention to important facts pertaining to Wasatch rock asphalt, which has been used extensively for street paving in a number of cities.

—Plans are being prepared by Lathbury & Spackman, consulting engineers, for the proposed plant of the Alma Portland Cement Company, of Wellston, Ohio, for the manufacture of cement. C. K. Davis is interested in the enterprise.

—The Joseph Dixon Crucible Company, Jersey City, N. J., celebrates our recent victories with a monthly calendar blotter carrying an appropriate design involving the cat and canary idea. A radiograph of the cat would reveal the canary.

—The New York Filter Company, 26 Cortlandt street, New York, has published in pamphlet form the excellent address delivered by Judge Hillyer, president of the Atlanta water board, before the convention of the League of American Municipalities.

—The American Fire Engine Company has just closed a contract for furnishing two first size "Metropolitan" steam fire engines to the St. Louis department, and has received an order from the same city for a Fox water-tube boiler to be attached to an old engine.

—A. L. Bogart Company, 123 Liberty street, New

York, call special attention to the Bartholdi automatic gas lighter. They carry in stock a complete assortment of frictional machines, Ruhmkorff coils, dynamo gas lighting torches, electric attachments for incandescent lights, etc.

—The Central Electric Company, of Chicago, are headquarters for all mica products, including mica, mica segments, micanite segments, micanite cloth, Empire cloth and M. I. C. compounds. These goods in all the various forms and types are carried in Chicago stock and can be supplied immediately.

—John Maslin & Son, 163-167 First street, Jersey City, N. J., have issued a new list of second-hand engines, boilers, pumps and other machinery. The list will be sent free to all inquiring for same. The Maslins are presenting a valuable attachment to all users of Pulsometer and other pumps of that class.

—The city of Buffalo, N. Y., is keeping well abreast of the times in its fire equipment, and has just placed an order with the American Fire Engine Company for a new first size Metropolitan engine. The American company has recently rebuilt a La France engine for Buffalo with a new Fox water-tube boiler, and is now placing an "American" pump on another La France engine for the same city. The Metropolitan type of engine is winning universal favor all along the line, and though but a few months on the market has already been furnished the fire departments of New York, Chicago, St. Louis and other large cities. It is equipped with the Fox boiler and the new American pump.